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The AUTOMOBILE

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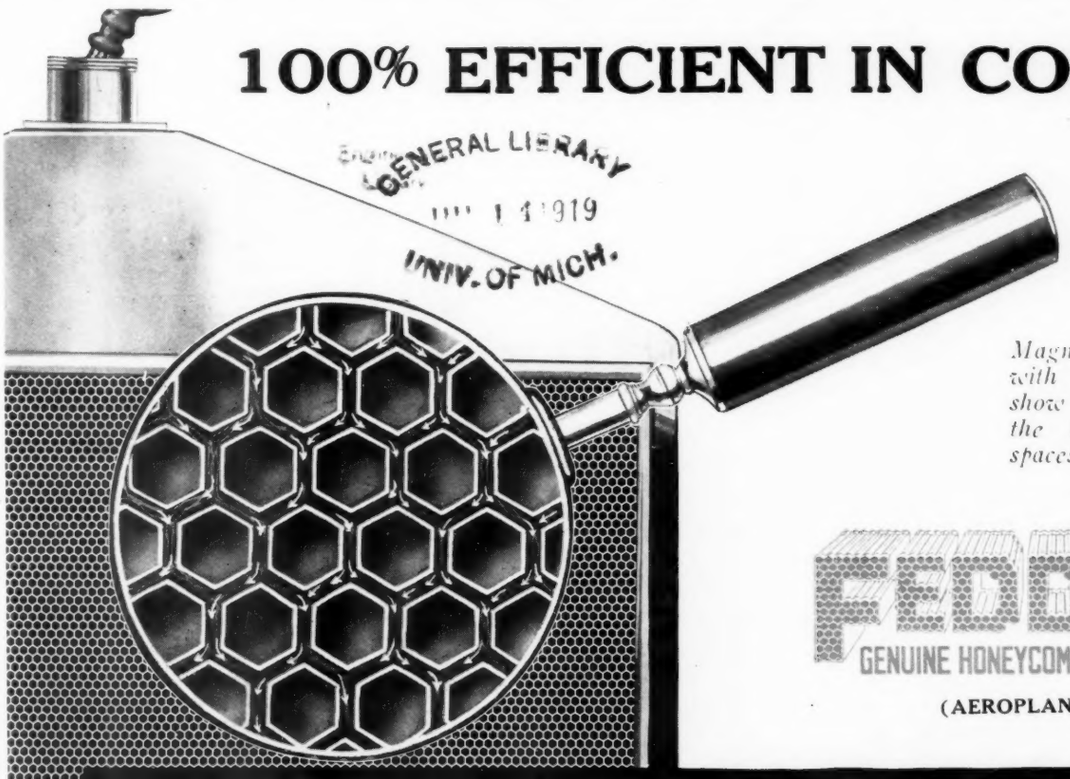

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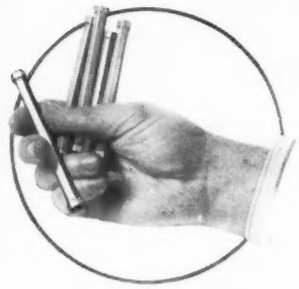
(AEROPLANE TYPE)



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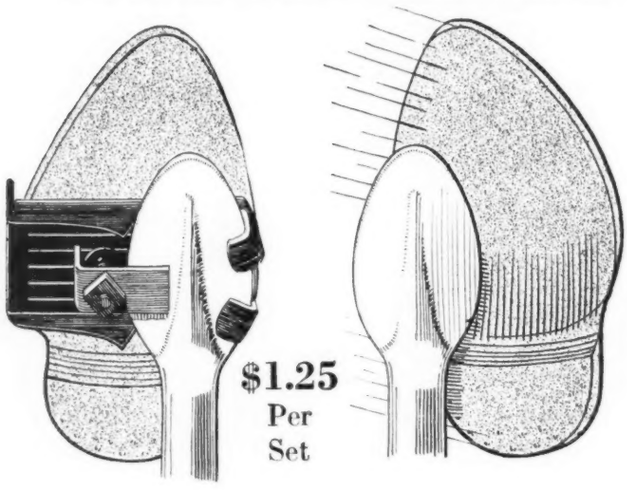

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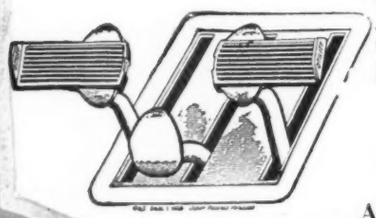

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XLI NEW YORK—THURSDAY, JULY 10, 1919—CHICAGO NO. 2

R-34 Flight Indicates Task of Commercial Aviation

Giant Dirigible Not Big Enough for Regular Journeys, Say Commander and His Advisors, and the Necessity of Hangars is Clearly Demonstrated by Task of Handling Ship at Terminal—Technical Study of Motor Plant and Official Log of Journey

ROOSEVELT FIELD, MINEOLA, N. Y., July 9.

THE giant British dirigible R-34 ready to-day to cruise toward her native heath after completing the first trans-oceanic flight of a lighter-than-air ship—from Scotland to Long Island—will carry navigating and engineering officers skeptical of immediate inauguration of regularly scheduled air voyages across the Atlantic.

The pioneers look for eventual attainment of this cardinal ambition of the world of aviation. They anticipate, too, development of dirigible craft beside which their own leviathan of the air would appear puny. But not until airships are built with far greater lifting capacity and motive power, in their opinion, will the journey above the clouds from continent to continent be sufficiently free of hazards and discomforts to make it commercially practicable. Another commercial necessity is hangars. The care of the ship while in field here, caused the officers more worry than the trip over the Atlantic.

The official view of the present day limitations of the dirigible, inspired not by pessimism, but by the hard-headed sense characteristic of British naval men, was advanced by Major G. H. Scott, commander, and Lieutenant J. D. Shotter, engineering officer of the R-34, in a discussion of their ship's performance with members of AUTOMOTIVE INDUSTRIES staff.

Brigadier General E. M. Maitland, chief of the Royal Air Force and an official passenger aboard the dirigible, predicted construction of airships with a 100-ton lift, as compared with the R-34's 60 tons, and with saloon, drawing room, smoking rooms, staterooms and roof garden among the accommodations. These craft, he declared, would be geared up to 100 m.p.h., and would carry fuel and provisions for a two or three weeks' non-stop trip, bringing them well within the requirements of overseas travel.

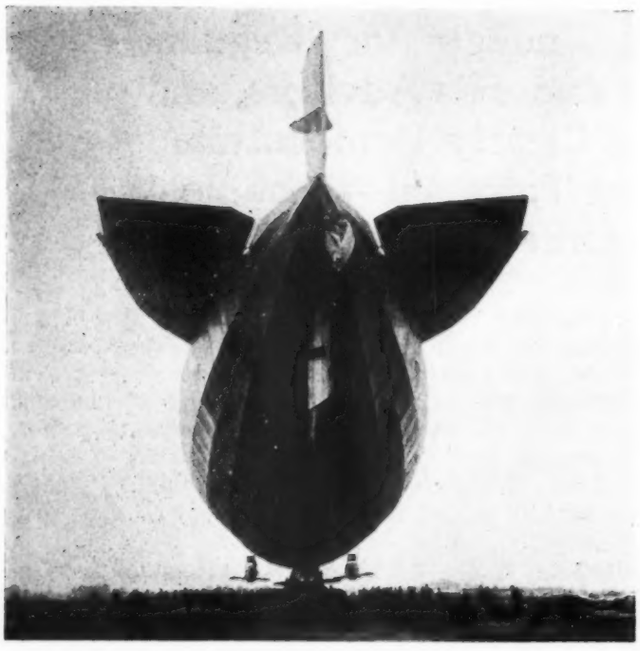
"Let us try something easier first," was Major Scott's rejoinder to a suggestion that the accomplishment of the huge power balloon might be the forerunner of a regular trans-Atlantic passenger service.

He forecast the establishment in the not far distant future of a European-American air route with stated trips, but declared ships of perhaps twice the size of the R-34 would be required to insure traveling conditions which would invite general patronage. Such craft, he said, would not necessarily have double the length and diameter (672 by 79 ft.) of the R type, but would be required to carry a much larger supply of fuel and exceed greatly the speed of the present ships, thus insuring a nearer approach to a fixed time for the passage and reducing to a minimum the risk of life and property through failure of the propulsion apparatus in the face of adverse weather.

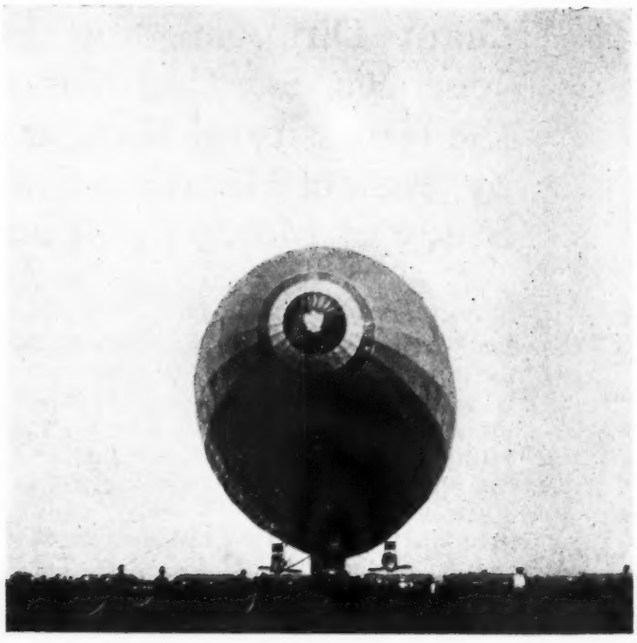
The commercial passenger dirigible, the commander asserted, should be capable of 100 m.p.h. in a dead

The Lines of British Dirigible

Three-quarter side view



From the stern



Head on

calm, but he advocated opening of routes spanning a few hundred miles and gradual development of fuel, inflation gas and mechanism to a stage affording practical trans-oceanic transportation.

Lieutenant Shotter shared the opinions of his commander. He urged the necessity of larger ships, as well, from the standpoint of affording more space for creature comforts. It was monotonous business—the R-34's 108-hr. cruise, with hardly a sight even of the fog-blanketed sea—and unless a passenger was especially fond of studying cloud formations the engineering officer feared he would suffer acutely from ennui on a similar voyage.

The lieutenant, of course, was discussing the question of elbow room from the passenger's standpoint. He was not criticising, from a naval aviation angle, the accommodations aboard the British dirigible, which are palatial, as compared with like features of the American Navy's NC4 and the Vickers-Vimy biplane, her predecessors in the ocean "hop."

Though, because of his arduous duties, he slept only four hours out of the 108—and got that much rest in half-hour naps—the engineering officer classed the trip from Scotland as a good passage. The mammoth craft cruised most of the way on an even keel, according to his description, and during periods off duty the crew found meals waiting and rest entirely possible in the living quarters within the envelope. These include a board floored mess hall, 25 by 15 ft., and sleeping cabins, connected by a gangway traversing the length

of the ship, with exits and rope ladders leading to the operating gondolas suspended from the balloon structure.

Though he rated the R-34 as under powered, her limited supply of petrol enforcing economical operation of the motors to such an extent that the average speed, against head winds, was only 29½ m.p.h., the voyage from Scotland, he said, was wholly successful from an engine standpoint. Motor troubles were of minor nature and restriction of the driving power to three engines most of the way was to conserve fuel and not because of mechanical difficulties. He saw no obstacle, as far as motor development was concerned, to regular trans-Atlantic passages, providing dirigibles were built large enough to carry a petrol supply that would permit the constant use of practically all the motors, with the resultant gain in speed.

Only once during the westward voyage, said the engineering officer, did his motors seriously misbehave. This was in the edge of an electric storm above the Bay of Fundy, a moment which raised before the eyes of the aerial navigators visions of being blown to sea, and prompted the wireless message to the American Navy Department asking for assistance because of too near exhaustion of the fuel supply to chance a second flight westward from mid-ocean. As the storm approached, Lieutenant Shotter averred, the air took on a sulphurous odor which he and his fellow officers could not explain, and the engines were erratic. However, propulsion was soon restored to normal and the ship came on to her American destination unaided.

Lieutenant Shotter described the independent location and operation of the R-34's five motors as favorable to the enforced economical use of fuel. In the forward, and largest, gondola, station of the commander, pilots, radio, meteorological and other operating officers, is one engine with propeller attached, operated by a one-man crew. The side cars carry a motor each, with a single attendant, and in the aft car are two engines, operating simultaneously or in shifts a single propeller. Engine control is maintained by means of telegraph signals, while the engineering officer conducts inspection service by moving periodically from car to car.

MAJOR C. H. SCOTT
Commander R-34

LIEUT. COMMANDER
A. C. READ
Commander NC-4

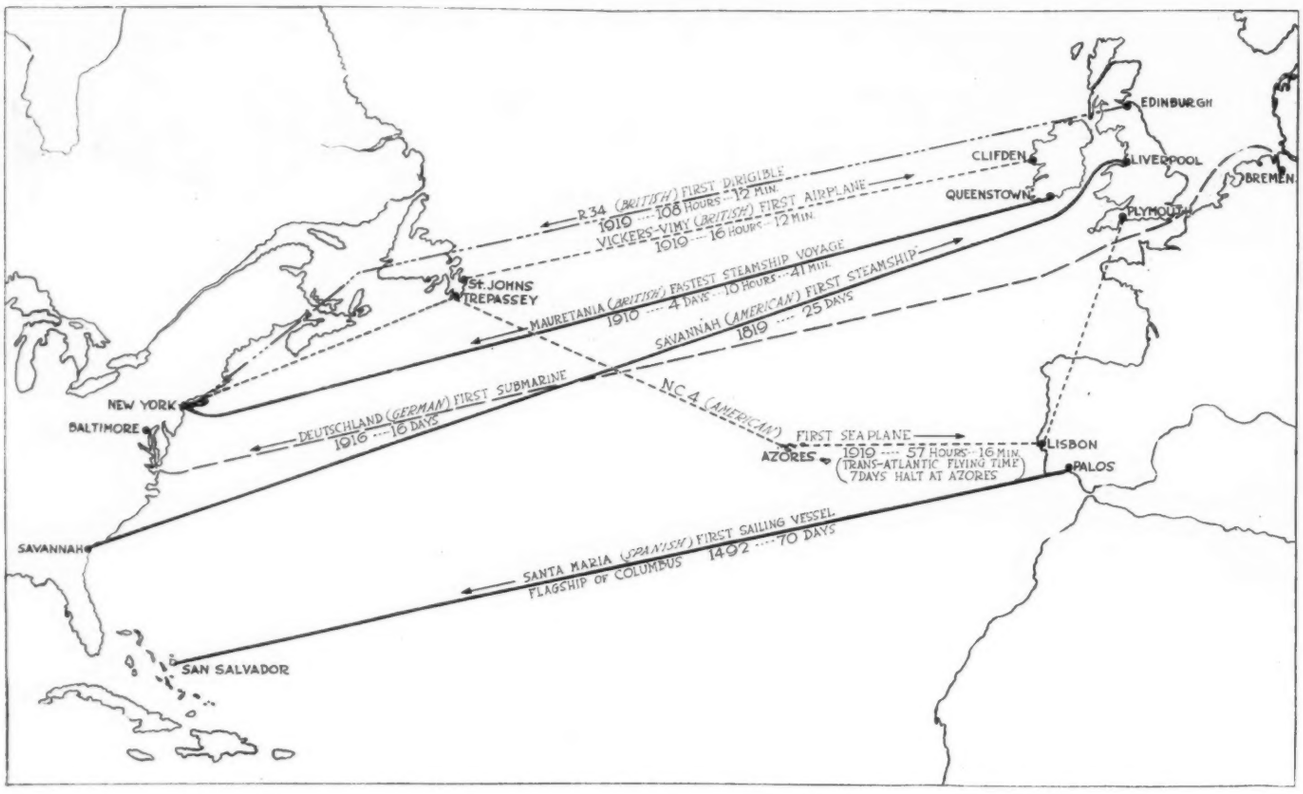
MAJ. J. E. M. PRITCHARD
First to Land

LIEUT. COMMANDER
Z. LANSDOWN
U. S. Observer

Its lifting power concentrated in nineteen gas bags separately inflated and deflated, the British dirigible is able to ascend with its motors working, carrying the thirty tons represented in its construction and an equivalent weight in crew, supplies and fuel. It brought here on the westward flight a company of thirty, including the crew and official passengers.

While the R-34, its silver-gray body visible for miles from Roosevelt Field, awaited favorable weather for the return trip to Europe, many thousands of persons viewed the mechanical monster, a strange spectacle even in a year of scientific exploits bordering upon the miraculous. The sightseeing hosts came away awed by the tremendous bulk and admiring the graceful lines of the huge "cigar" and the studiously inclined among the spectators saw in the solicitous care given the anchored craft by scores of officers and hundreds of soldiers one of the important obstacles to commercializing lighter-than-air flying. Added to the high cost of the dirigible, said to have aggregated $2,000,000 in the case of the R-34, is the ever present possibility of its destruction because of insufficient

Routes of Record Voyages Across the Atlantic



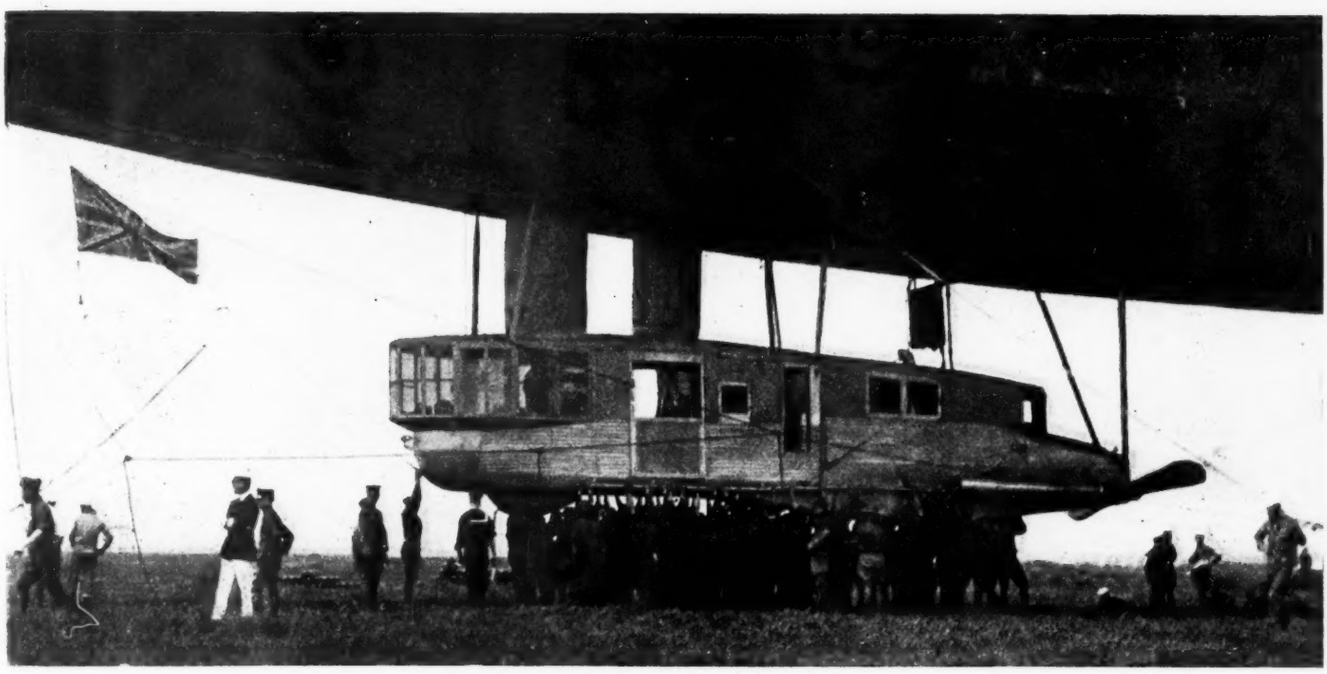
NOTABLE CROSSINGS OF THE ATLANTIC

Sailing Port	Date	Means of Travel	Time	Arriving Port
Palos, Spain	1492	Sailing Ships (Columbus)	70 days	San Salvador
Savannah	1819	Steamship Savannah	25 days	Liverpool
Boston	1845	Packet Ship Yorkshire	21 days	Liverpool
New York	1851	Clipper, Flying Cloud	15 days	Liverpool
New York	1856	Steamship Persia	9 days 1 hr.	Liverpool
New Foundland	1858	Cable Message	.....	Ireland
New Foundland	1901	Wireless Message	.....	Ireland
Queenstown	1910	Steamship Mauretania	4 days 10 hr.	New York
Quebec	1911	Turbine S.S. Virginia	3 days 11 hr.	Liverpool
Bremen	1916	Submarine Deutschland	16 days	Baltimore
Trepassey, N. F.	1919	NC-4 (Seaplane)	57 hr. 16 min.	Lisbon
St. John's	1919	Vickers-Vimy (Biplane)	16 hr. 20 min.	Clifden, Ireland
Edinburgh	1919	R-34 (Dirigible)	108 hr. 12 min.	New York

mooring accommodations. Until overseas cruising can be so perfected as to make certain the landing of the balloon at an appointed destination, where a hangar is available, practical and profitable operation for such distances will hardly be within the range of reasonable possibility. Concrete anchorages had been sunk to hold the hawsers of the giant craft, but it was necessary, even in the gentle July breeze, to release the moorings at one end, letting the bag swing with the wind while several hundred aviation troops trained for the purpose held the unattached cable and "walked" the gondolas around with the moving superstructure.

Whether the balloon could have stood a strong wind was not demonstrated, but the fate of the American Navy's C-5, blown to sea off the Newfoundland coast on the eve of a projected cruise to the British Isles, is an indication of the risk in mooring lighter-than-air fliers in an open field.

The R-34 had been through one experience of this kind. Before the 21-hour Baltic cruise, the real preparation for the transocean voyage, the craft was blown from moorings in England and lost in the fog for 19 hours. Fortunately the R-34, at the time of this informal test, was well stored with all supplies and was in no actual danger at any time.



Forward gondola, ship control and one motor

Log of the Pioneer Dirigible Trip

A GRAPHIC story of the pioneer dirigible trip was written by Big. Gen. E. M. Maitland in the form of a report to the British Air Ministry, of which he was the official representative on the trip. His story consisted chiefly of a log of the journey, his observations being jotted down with date and hour as the happenings appeared before him, preceded by a brief statement of the accomplishments written after the successful ending of the trip. His log follows:

By Brig. Gen. E. M. Maitland, G.M.C., D.W.O., Representing British Air Ministry

London, England, for Air Ministry:

Atlantic flight by rigid airship R-34 from East Fortune, Scotland, to Long Island, New York, via Newfoundland:

Distances covered were as follows: East Fortune to Trinity Bay, Newfoundland, 2050 sea miles. Trinity Bay, Newfoundland, to New York, 1080 sea miles.

It was originally intended that this flight should have taken place at the beginning of June, but owing to the uncertainty of the Germans signing the peace terms the British Admiralty decided to detain her for an extended cruise up the Baltic and along the German coast line. This flight occupied fifty-six hours under adverse weather conditions, during which time an air distance of roughly 2400 miles was covered.

At the conclusion of this flight the ship was taken over from the Admiralty by the Air Ministry, and the airship was quickly overhauled for the journey to the United States of America.

The date and time of sailing decided upon was 2 a. m. on the morning of Wednesday, July 2, and the press representatives were notified by the Air Ministry to be at East Fortune the day previously.

At 1.30 a. m. on the early morning of Wednesday, July 2, the airship was taken out from her shed and actually took the air twelve minutes later, thus starting on her long voyage exactly eighteen minutes in advance of scheduled time.

1.42 a. m., Wednesday, July 2:

The R-34 slowly arose from the hands of the landing party and was completely swallowed up in the low-lying clouds at a height of 100 ft. When flying at night, possibly on account of the darkness, there is always a feeling of loneliness immediately after leaving the ground. The loneliness on this occasion was accentuated by the faint cheers of the landing party coming upward through the mist long after all signs of the earth had disappeared.

The airship rose rapidly 1500 ft., at which height she emerged from the low-lying clouds and headed straight up the Firth of Forth toward Edinburgh.

A few minutes after 2 o'clock the lights of Rosyth showed up through a break in the clouds, thus proving brilliantly that the correct allowance had been made for the force and direction of the wind, which was 20 miles per hour from the east.

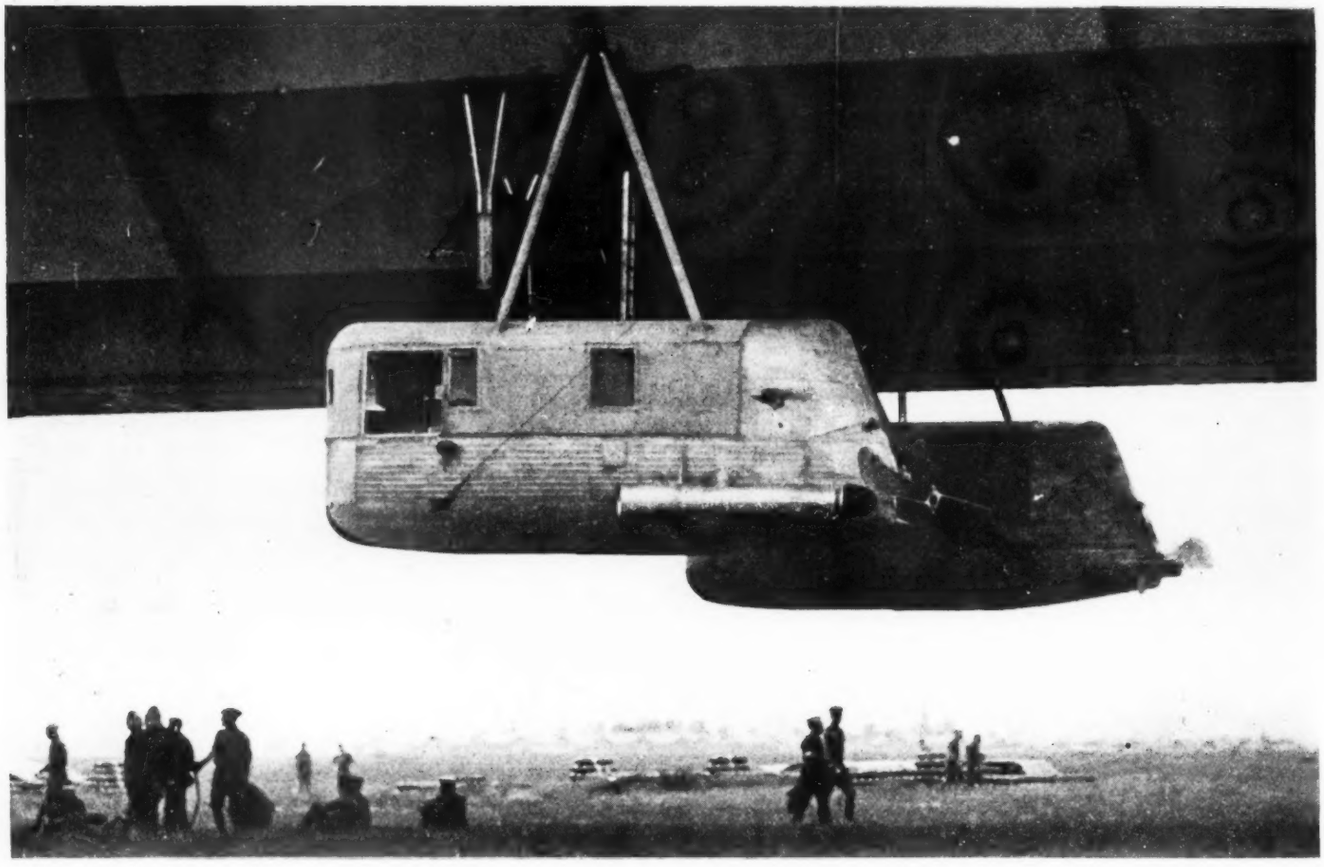
It should be borne in mind that when an airship gets out on a long-distance voyage carrying her maximum allowance of petrol she can only rise to a limited height at the outset without throwing some of it overboard as ballast, and that as the airship proceeds on her voyage she can, if so desired, gradually increase her height as the petrol is consumed by the engine.

An airship of this type, when most of her petrol is consumed, can rise to a height of about 14,000 ft.

For this reason the next few hours were about the most anxious periods during the flight for Major Scott, the captain of the ship, who, owing to the large amount of petrol carried (4900 gal., weighing 15.8 tons) had to keep the ship as low as possible and at the same time pass over northern Scotland, where the hills rise to a height of over 3000 ft.

Owing to the stormy nature of the morning the air at

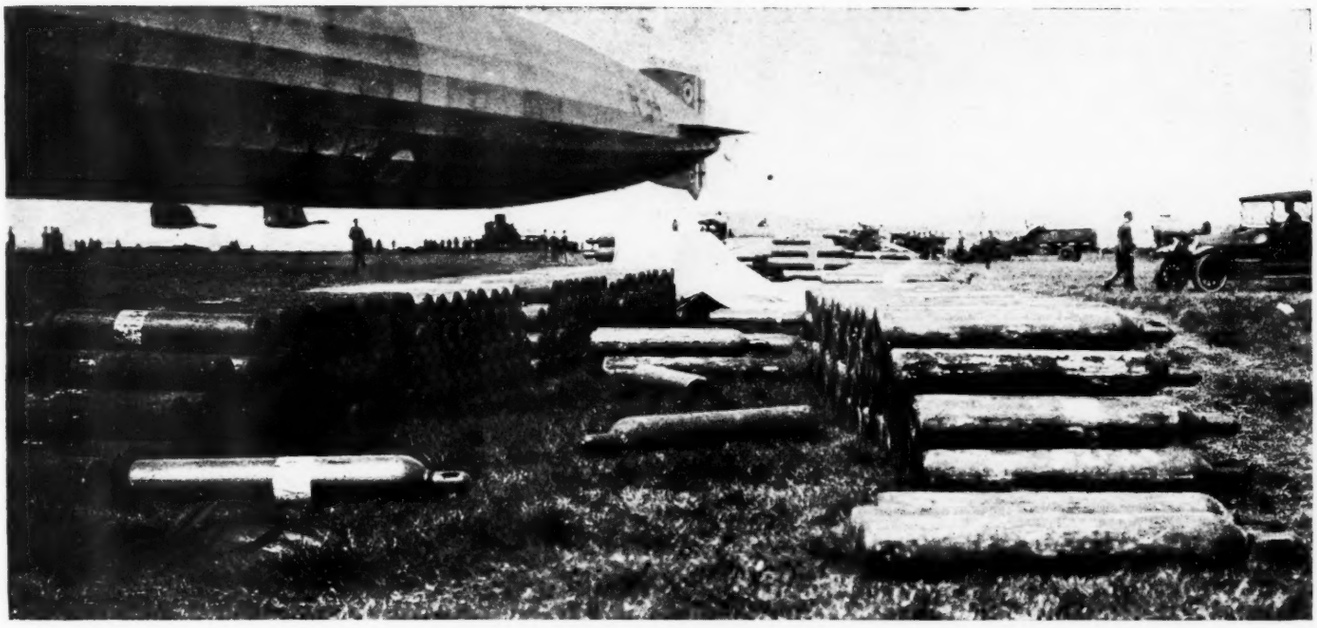
Where Dirigible Gets Its Power



Side cars, one motor in each

Aft gondola, one motor

Hydrogen for the Journey Home



1500 ft.—the height at which the airship was traveling—was most disturbed and "bumpy," due to the wind being broken up by the mountains to the north, causing violent wind currents and "air pockets."

The most disturbed conditions were met in the mouth of the Clyde, south of Loch Lomond, which, surrounded by high mountains, looked particularly beautiful in the gray dawn light.

The islands at the mouth of the Firth of Clyde were quickly passed. The north coast of Ireland appeared for a time, and shortly afterward faded away as we headed out into the Atlantic.

The various incidents of the voyage are set down quite simply as they occurred, and more or less in the form of a diary. No attempt has been made to write them as a connected story. It is felt that, by recording each incident in this way, most of them trivial, a few of vital importance, a truer picture of the voyage will be obtained.

Time 6 a. m., July 2.

Airship running on four engines with 1600 revolutions. Forward engine being given a rest. Air speed 38 knots—land miles per hour made good 56.7. Course steered 298 deg. north, 62 deg. west. Course made good 39 deg. north, 71 west. Wind northeast 15 1/3 miles per hour. Height 1500 ft. Large banks of fleecy cloud came rolling along from the Atlantic, gradually blotting out all view of the sea. At first we were above these clouds, but gradually they rose higher, and we plowed our way into the middle of them.

7 a. m.—Nothing but dense fog estimated by Harris, the meteorological officer, to go down to within 50 ft. of the water and up to a height of about 5000 ft.

Suddenly we catch a glimpse of the sea through a hole in the clouds, and it is now easy to see we have a slight drift to the south which was estimated by both Scott, the captain, and Cooke, the navigating officer.

A few minutes later we find ourselves above the clouds, our height still being 1500 ft., and beneath a cloudy sky with clouds at about 8000 ft. We are therefore in between two layers of clouds, a condition in which Alcock and Brown found themselves on more than one occasion on their recent flight from west to east.

An excellent cloud horizon now presents itself on all sides, of which Cooke at once takes advantage. These observations, if the cloud horizon is quite flat, ought to prove a valuable rough guide, but cannot be regarded as accurate unless one can also obtain a check on the sun by day or the moon and stars by night.

Cooke reckons it is easy to make as much as a 50-mile error in locating one's position when using a cloud horizon as substitute for a sea horizon.

7.30 a. m.—Breakfast in crew space up in the keel consisted of cold ham, one hard-boiled egg each, bread and butter, and hot tea. We breakfast in two watches, generally about fifteen in each.

The first watch for breakfast was Scott, Cooke, Pritchard, Admiralty airship expert; Lansdowne, Lieut. Commander, United States Airship Service; Shotter, engineer officer; Harris, meteorological officer, myself, and half the crew.

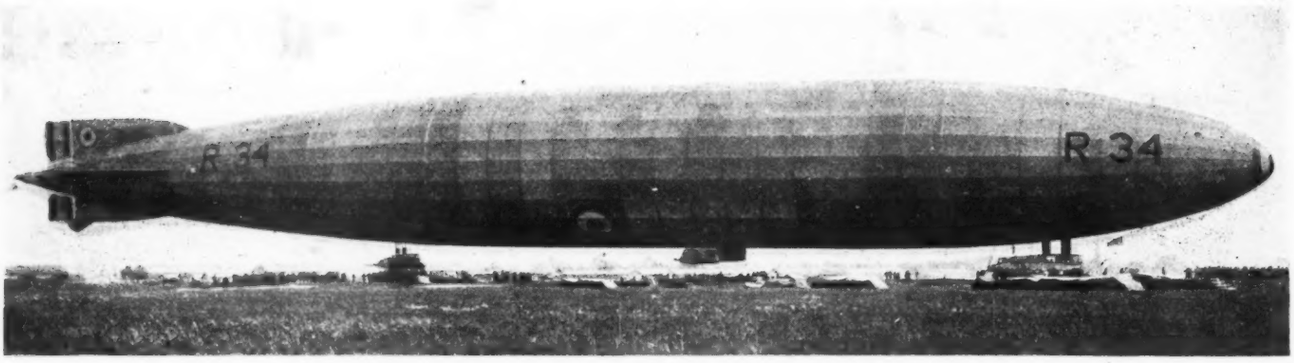
Conversation during breakfast reverted to the recent flight up the Baltic, and in the adjoining compartment the graphophone was entertaining the crews to the latest jazz tunes, such as "The Wild, Wild Women."

It might be interesting at this stage to give a complete list of the crew, showing their various duties:

SHIP'S OFFICERS

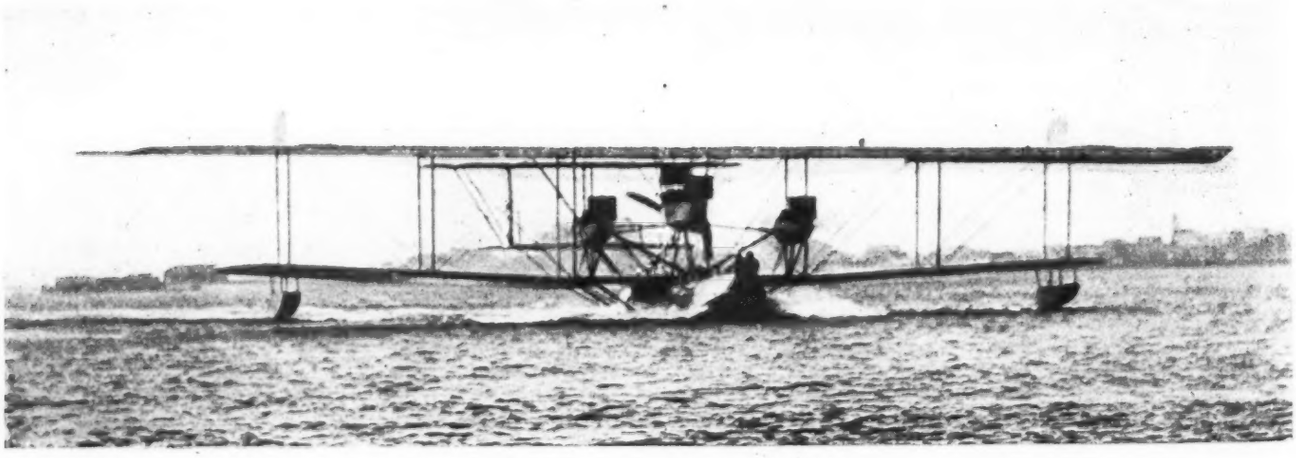
Major G. H. Scott, A. F. C., Captain.
Captain G. S. Greenland, First Officer.
Second Lieutenant H. F. Luck, Second Officer.
Second Lieutenant J. D. Shotter, Engineer Officer.
Brig. Gen. E. M. Maitland, C. M. G., D. S. O., representing Air Ministry.
Major J. E. M. Pritchard (Air Ministry).
Lieut. Commander Z. Lansdowne, O. B. E., U. S. Naval Airship Service.
Major G. G. H. Cooke, D. S. C., Navigating Officer.
Lieutenant Guy Harris, Meterological Officer.
Second Lieutenant R. D. Durrant, Wireless Officer.
W. O. W. R. Mayes, Coxswain.

Aerial Transatlantic Pioneers

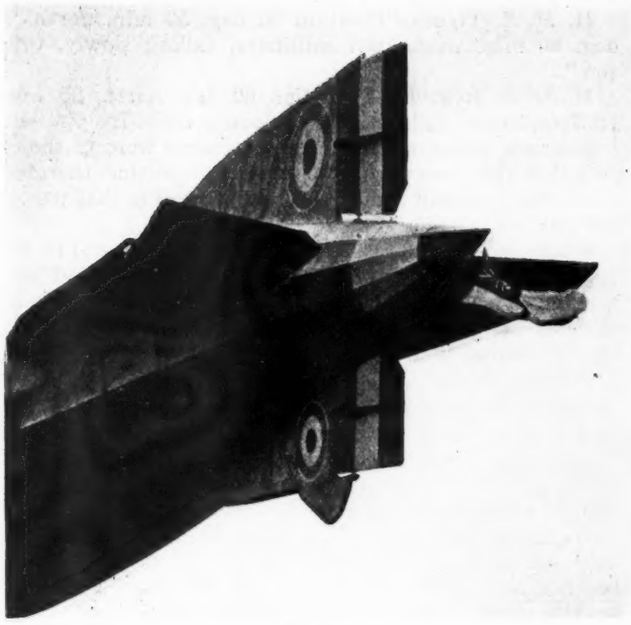


The R-34

The Vimy Vickers



The NC-4



Tail view

Distributing mail brought on dirigible

ENGINEERS

Flight Sergeant Gent.
Flight Sergeant Scull.
Flight Sergeant Riplee.
Sergeant Evenden.
Sergeant Thirlwall.
Corporal Cross.
Lg. Air Craftsman Graham.
Corporal Gray.
Air Craftsman Parker.
Air Craftsman Northeast.
L. A. C. Mort.

RIGGERS

Flight Sergeant Robinson.
Sergeant Watson.
Corporal Burgess.
Corporal Smith.
L. A. C. Forteath.
L. A. C. Browdie.

WIRELESS TELEGRAPHY OPERATORS

Corporal Powell.
A. C. Edwards.

11 a. m.—Still ploughing our way through the fog at 1300 ft. Sea completely hidden by clouds and no visibility whatsoever. Stopped forward and two aft engines and now running on only two wing engines at 1600 revolutions. These are giving us an air speed of 30 knots or 33.6 miles per hour. This is the airship's most efficient speed as she only consumes on the two engines 25 gal. of petrol per hour.

Wind is east 7 miles per hour and so we are making good 40 miles per hour and resting three engines.

Cook is now on top of the airship taking observations of the sun, using the cloud horizon with a sextant. The sun is visible to him but not to us, the top of the ship being 85 ft. above us down here in the fore central cabin.

Our position is reckoned to be latitude 55 deg. 10 min. north and longitude 14 deg. 40 min. west, which is equivalent to 400 miles from our starting point at East Fortune and 200 miles out in the Atlantic from the northwest coast of Ireland.

We are in wireless touch with East Fortune, Clifden, on the west coast of Ireland, and Ponta Delgada, Azores, and messages wishing us good luck are received from Air Ministry, H. M. S. Queen Elizabeth, and others.

11.45 a. m.—Lunch—Excellent beef stew and potatoes, chocolate and cold water.

The talk, as usual, was mainly "shop," dealing with such problems as the distribution of air pressure on the western side of the Atlantic, what winds were likely to be met with, what fog we should run into, the advantages of directional wireless for navigational purposes, cloud horizons, and the like.

Scott, Cooke and Harris, in comparing their experiences and expounding their theories, were most interesting and illuminating.

12 noon—Watch off duty turned in for their routine four hours' sleep before coming on for their next period of duty—only two hours in this case, as it is the first of the two dog watches.

The sleeping arrangements consist of a hammock for each of the men off watch suspended from the main ridge girder of the triangular internal keel which runs from end to end of the ship. In this keel are situated the 81 petrol tanks, each of 71-gal. capacity; also the living quarters for officers and men, and storing arrangements for lubricating oil for the engines, water ballast, food and drinking water for the crew. The latter is quite a considerable item as will be seen from the following table of weights:

	Gallons	Pounds	Tons
Petrol	4,900	35,300	15.8
Oil	....	2,070	.9
Water	....	....	3.0
Crew and baggage	....	....	4.0
Spares	....	550	.2
Drinking water	....	800	.42
Total			24.32

Life in the keel of a large rigid airship is by no means unpleasant. There is very little noise or vibration except when one is directly over the power units—a total absence of wind and except in the early hours of dawn

greater warmth than in the surrounding atmosphere.

Getting into one's hammock is rather an acrobatic feat, especially if it is slung high, but this becomes easy with practice; preventing one's self from falling out is a thing one must be careful about in a service airship like the R-34.

There is only a thin outer cover of fabric on the underside of the keel on each side of the walking way, and the luckless individual who tips out of his hammock would in all probability break right through this and soon find himself in the Atlantic.

It is surprising the amount of exercise one can get on board an airship of this size. The keel is about 600 ft. long, and one is constantly running about from one end to the other. There are also steps in a vertical ladder to the top of the ship for those who feel energetic or have duty up there. By the time it comes one's turn to go to bed one generally finds one is very sleepy and the warmth of one's sleeping bag and hum of the engines soon send one to sleep.

3.15 p. m.—Sea now visible at intervals through the clouds—a deep blue in color with a big swell on. Our shadow on the water helps us to measure our drift angle, which both Scott and Cooke worked out to be 21 deg. Running on the forward and two aft engines, resting the two wing engines. Speed—making good 49 miles per hour.

Durant, the wireless officer, reports he has just been speaking to St. John's, N. F. Rather faint but quite clear signals. As we are still in touch with East Fortune and Clifden and have been exchanging signals with the Azores since reaching the Irish coast, our communications seem to be quite satisfactory.

Remarkable rainbow effects on the clouds: One complete rainbow encircled the airship itself, and the other, a smaller one, encircled the shadow. Both are very vivid in their coloring.

3.45 p. m.—Excellent tea consisting of bread and butter and green gage jam, also two cups of scalding hot tea, which had been boiled over the exhaust pipe cooker fitted to the forward engine.

Fruitarian cake was also tried for the first time—rather sickly to taste, but very nourishing. The whole assisted by Miss Lee White on the gramophone. We would one and all give anything for a smoke. Greenland, the first officer of the ship, is vainly trying to discover the culprit who used his toothbrush for stirring the mustard at lunch.

4.30 p. m.—Still in fog and low clouds and no sea visible. We have hardly seen any sign of the Atlantic since leaving the Irish coast, and we are beginning to wonder if we shall see it at all the whole way across.

5 p. m.—Tramp steamer S. S. Ballygally Head, outward bound from Belfast, destination Montreal, picked up our wireless on their Marconi spark set, which has a range of 30 miles only. She heard us, but didn't see us as we were well above and completely hidden by the clouds. She gave her position as latitude 54 deg. 30 min. north, longitude 18 deg. 20 min. west, and reported as follows:

"Steering south 80 west true, wind north, barometer 30.10, overcast, clouds low.

(Signed) SUFFREN, Master."

They were very surprised and most interested to hear we were R-34 bound for New York and wished us every possible luck.

5.30 p. m.—Messages were received from both H. M. S. battle cruisers Tiger and Renown, which had been previously sent by the Admiralty out into the Atlantic to assist us with weather reports and general observation. They reported respectively as follows:

H. M. S. Tiger—"Position 36 deg. 50 min. north, 36 deg. 50 min. west, 1027 millibars, falling slowly, thick fog."

H. M. S. Renown—"Position 60 deg. north, 25 west, 1027 millibars, falling slowly, cloudy, visibility 4 miles."

Harris's deductions from these reports were to the effect that there was no steep gradient and that therefore there was no likelihood of any strong wind in that part of the Atlantic.

6 p. m.—Scott increases height to 2000 ft., and at this height we find ourselves well over the clouds and with a bright blue sky above us. The view is an enchanting one—as far as one can see a vast ocean of white fleecy clouds, ending in the most perfect cloud horizons.

Two particularly fine specimens of windy cirrus clouds, of which Pritchard promptly obtained photographs, appear on our port beam, also some "cirrus ventosus" clouds (little curly clouds like a blackcock's tail feathers), all of which Harris interprets as a first indication and infallible sign of a depression coming up from the south.

We hope that this depression, when it comes, may help us, provided we have crossed its path before it reaches us. If we can do this we may be helped along by the easterly wind on the northwesterly side of the depression. It is interesting to note that as yet we have received no notice of this depression coming up from the south in any weather reports.

6.40 p. m.—Put back clock one-half an hour to corrected Greenwich mean time. Time now 6.10 p. m. Position: Latitude 53 deg. 50 min. north; longitude 20 deg. west.

We have covered 610 sea miles, measured in a direct line, in 17 hours, at an average speed of 36 knots, or 40 miles per hour. Depth of Atlantic at this point 1500 fathoms. At this rate, if all goes well and if that depression from the south dosen't interfere, we should see St. John's—if visible and not covered in fog as it usually is—about midnight to-morrow, July 3.

6.55 p. m.—Wireless message from Air Ministry via Clifden states:

"Conditions unchanged in British Isles. Anti-cyclone persistent in eastern Atlantic—a new depression entering Atlantic from south."

This confirms Harris's forecast and is an admirable proof of the value of cloud forecasting.

7 p. m.—The clouds have risen to our height and we are now driving away through them with no signs of the sky above or the sea underneath. Scott reckons the wind is northeast by east and helping us slightly. Airship now very heavy owing to change in temperature and 12 deg. down by the stern. Running on all five engines at 1600 revolutions, height 3000 ft.

8 p. m.—We are just on top of the clouds, alternately in the sun and then plunging through thick banks of clouds. The sun is very low down on the western horizon and we are steering straight for it, making Pritchard at the elevators curse himself for not having brought tinted glasses. Ship now on an even keel.

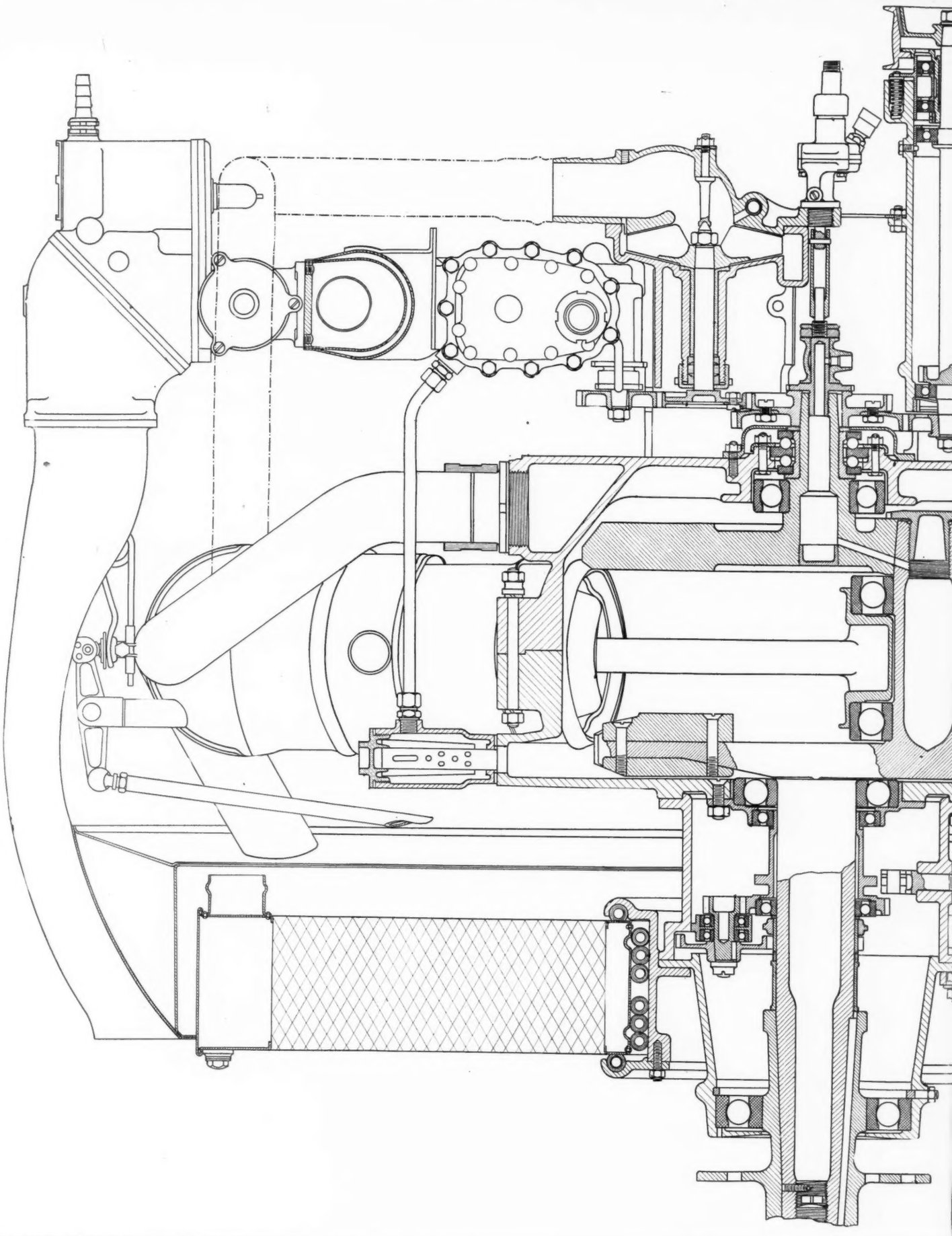
8.30 p. m.—Scott decided to go down underneath the clouds and increases speed on all engines to 1800 revolutions to do so. Dark, cold and wet in the clouds and we shut all windows.

We see the sea at 1500 ft. between patches of clouds. Rather bumpy.

We now find ourselves between two layers of clouds, the top layer 1000 ft. above us and the lower layer 500 ft. below, with occasional glimpses of sea.

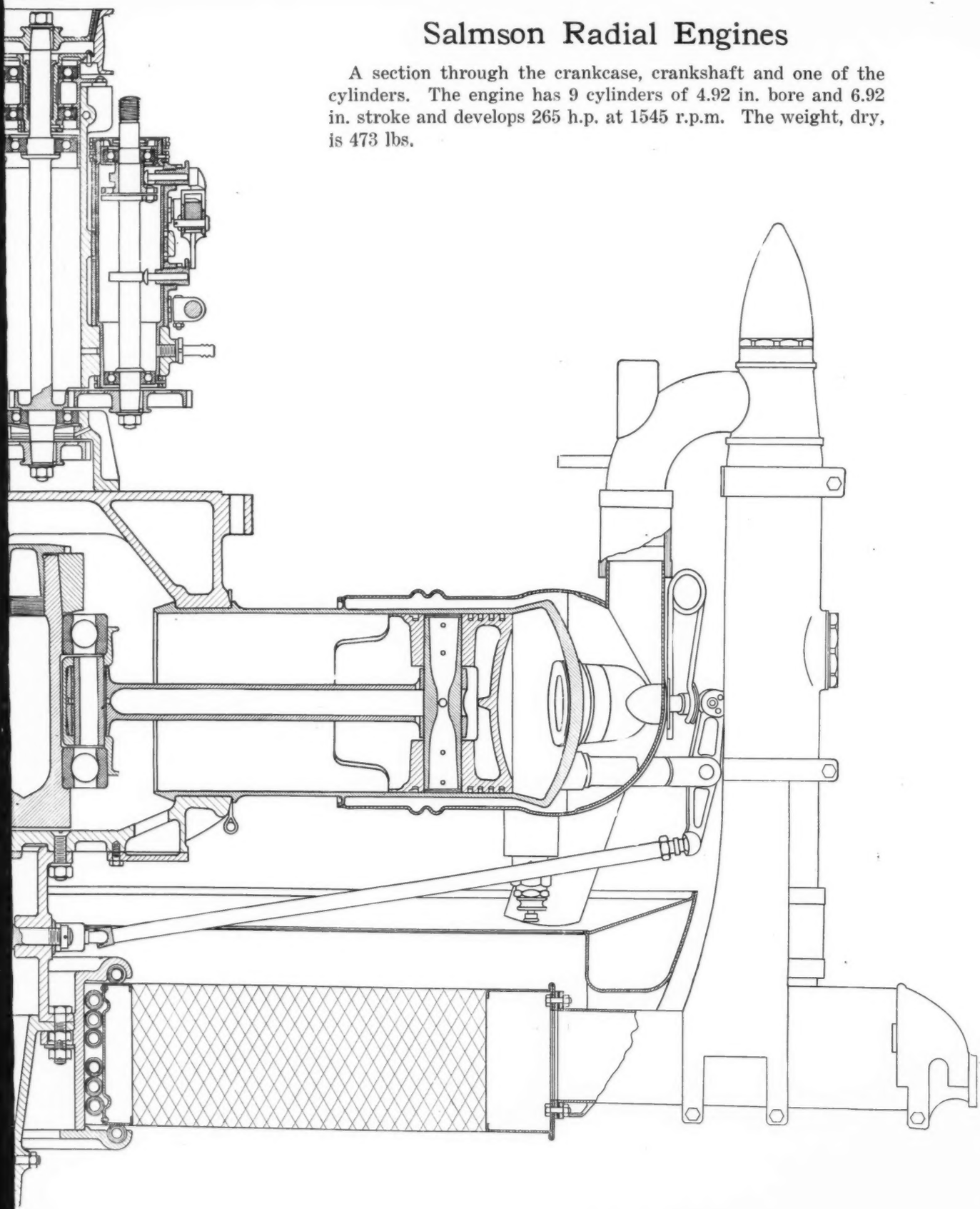
9 p. m.—The sun is now setting and gradually disappears below the lower cloud horizon, throwing a wonder-

(*Continued on page* 79)



Salmson Radial Engines

A section through the crankcase, crankshaft and one of the cylinders. The engine has 9 cylinders of 4.92 in. bore and 6.92 in. stroke and develops 265 h.p. at 1545 r.p.m. The weight, dry, is 473 lbs.



FRANCE'S LIBERTY ENGINE
The Amazing Salmson

Only one aircraft power plant in manufacture at the beginning of the war came out of that conflict practically intact, and here is a description of that engine. It is of a peculiar type, known as the water cooled star.

By W. F. Bradley

WHEN the war was turned loose on France, that country, like other of the allied nations, was totally unprepared for the onrush of the German aircraft. But France bravely accepted the challenge, and, while the other countries were developing aircraft, did the best she could. She did not hold the German air raiders back, but she worried them.

The reason that France did so well was the Salmson engine. This engine had been demonstrated only a few months before the outbreak of the war at an official aviation competition. It was then proven that the Salmson was the only reliable aviation engine made in France. Engine manufacturers in France were not much interested in aviation; they saw little future to it. The Salmson engine had been in production since 1911, but, like most engines of unusual type and for unusual purposes, it had not attracted much attention. But it came into its own at this competition to a sufficient degree to be recognized, when the emergency came, as the only dependency.

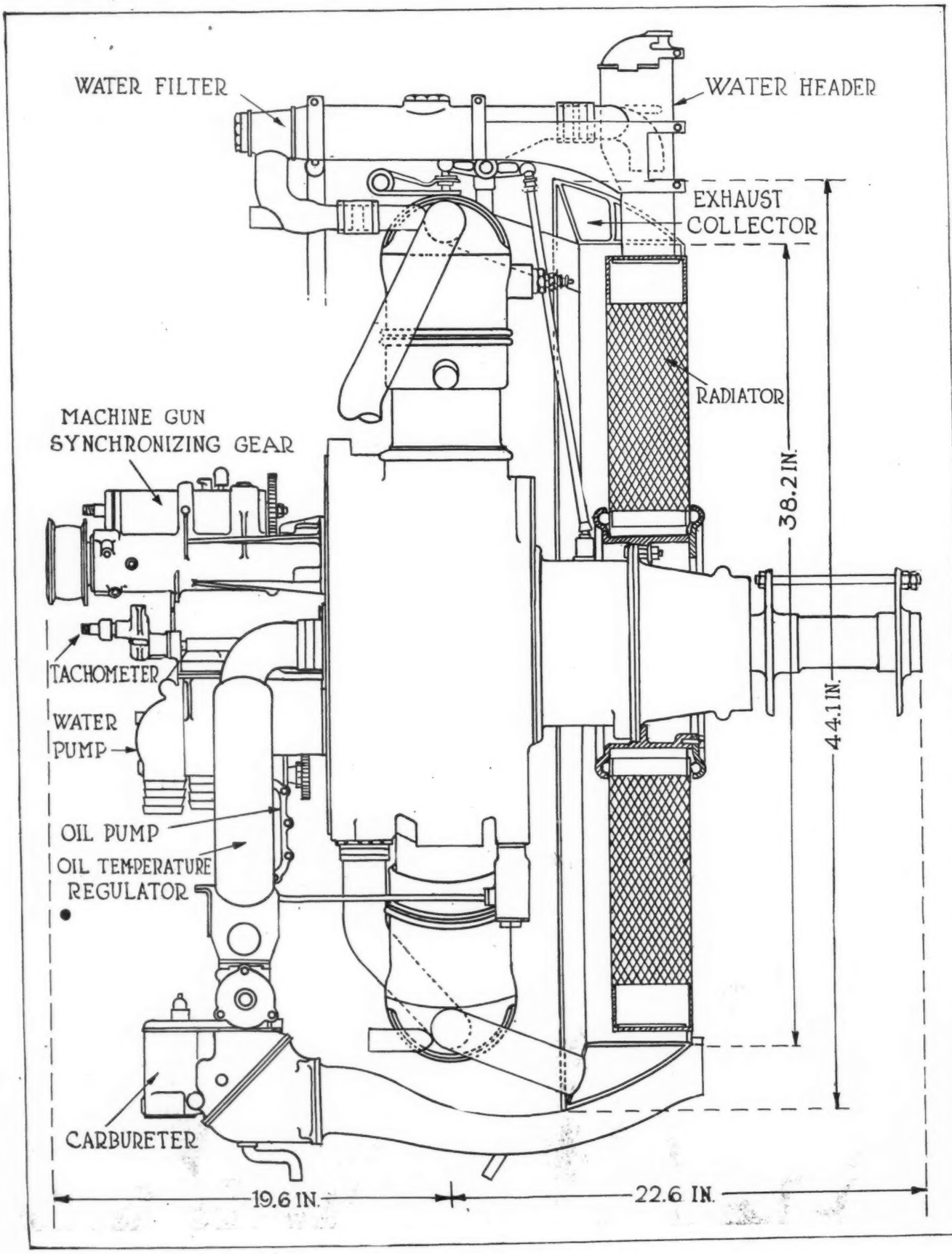
YOU will like this story, and it's important, too. Of course, you knew that France had engines in her airplanes and likely you heard that the Salmson was so used. But what do you know about the Salmson? W. F. Bradley, European Correspondent of Automotive Industries, now raises the veil of mystery that has enveloped this engine. Mr. Bradley is thoroughly competent to describe an engine and in this story he has equipped himself with many photographs and drawings. It is a good story of an unusual engine.

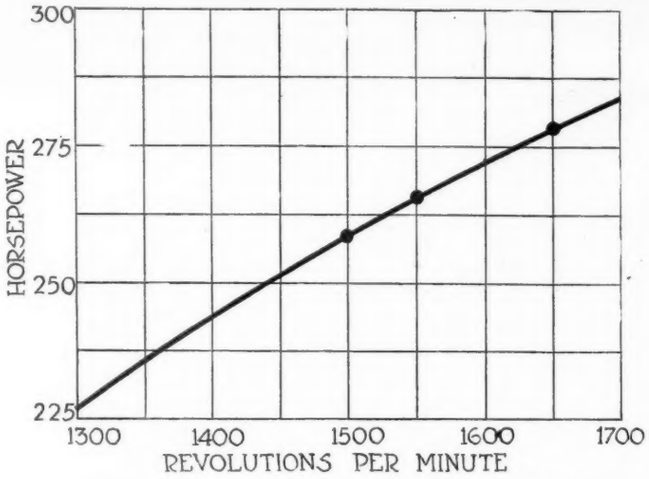
At the competition referred to the Renault 8-cylinder air-cooled gave poor results, and within a few months of the outbreak of the war had ceased to exist; the Gnome and Le Rhone companies, then separate concerns, failed to make a satisfactory showing in this competition. No satisfactory vertical or V water-cooled engine existed in France.

The Salmson was then regarded as sort of a nondescript. It is intermediate between the rotary air cooled aviation engine and the fixed cylinder water-cooled type and is a water-cooled star type. The Salmson Company is the leading, if not the only, exponent of this type. The outstanding features of this engine are nine steel, water-cooled cylinders mounted around a circular crankcase, the crankcase and cylinders being fixed, and the single-throw crankshaft revolving.

Fighting and reconnaissance plane built specially to receive the Salmson radial engine

General Layout of Salmson Engine and Components with Overall Dimensions



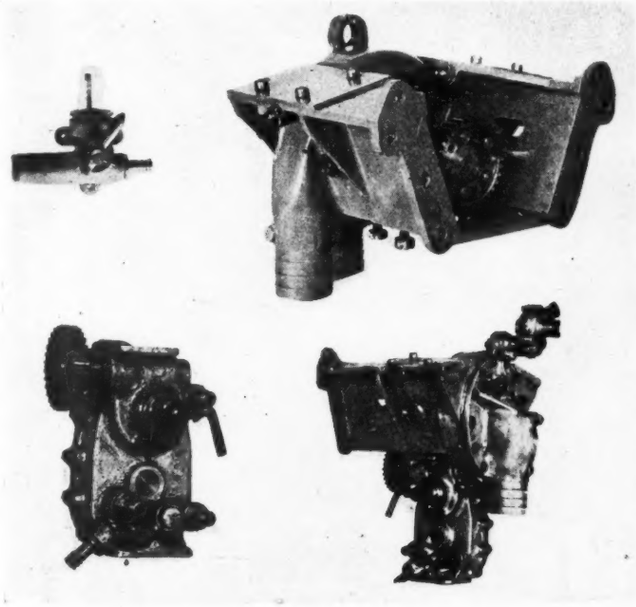


Horsepower curve of Salmson 9-cylinder 4.92 x 6.69 in. engine with a compression ratio of 5.4, at an atmospheric pressure of 30 in. mercury. The three points on the line represent the normal and maximum operating speeds and the absolute limit

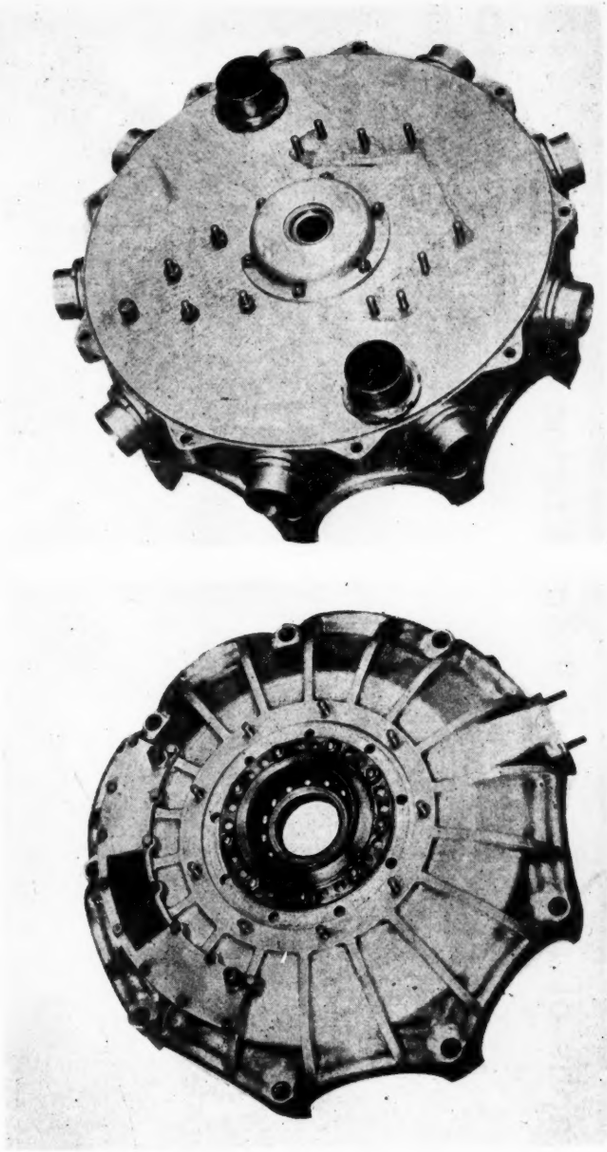
With the war, the fixed vertical, or V-cylinder, water-cooled type came rapidly to the front, but for a long time there was discussion as to whether this or the air-cooled rotary was the more suitable.

The Salmson went through the war almost unaffected by this. It was modified and improved in details, but so far as its main features of design are concerned, it was the same in 1918 as in 1914. Further, it had earned for itself the reputation of being one of the most reliable engines the French possessed. It was in regular production up to 270 hp., for which power it is lighter per horsepower than any of the vertical or V types. The weight per horsepower can be kept as low as on the air-cooled rotary types, and the Salmson has the advantage of being as economical in gasoline and oil consumption as any of the vertical types.

While the rotary air cooled engines are limited in size, owing to the difficulties of cooling which crop up when more than one group of cylinders is employed, the water cooled star engine can be increased practically without limit. In this connection, it should be mentioned that other firms than the Salmson are interesting themselves in the star type for horsepowers up to 1000, this increase in power being obtained by doubling or trebling the number of cylinders.



Oil pump and water pump housings. The former is bolted on the under face of the water pump housing

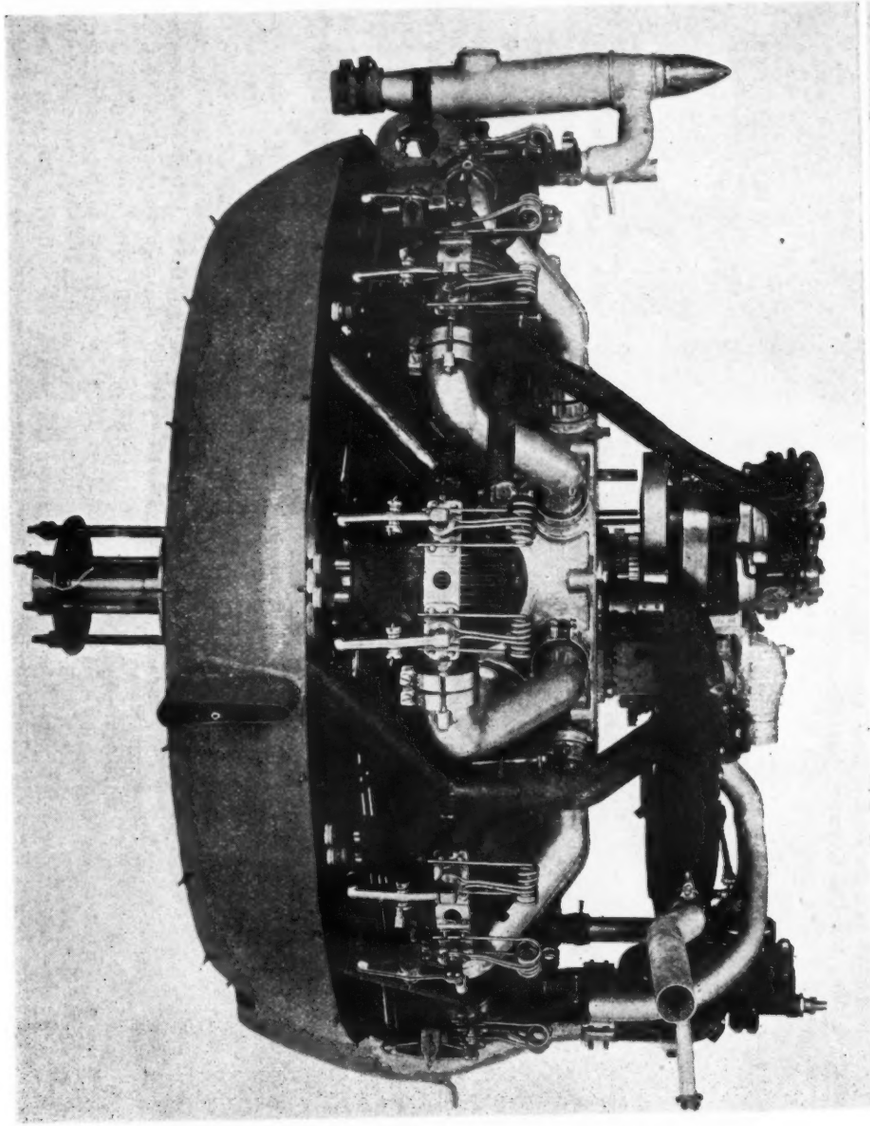


Below—Forward half of crankcase. Above—Rear half of crankcase, showing the two main intake pipes and the nine intake pipe connections to the cylinders

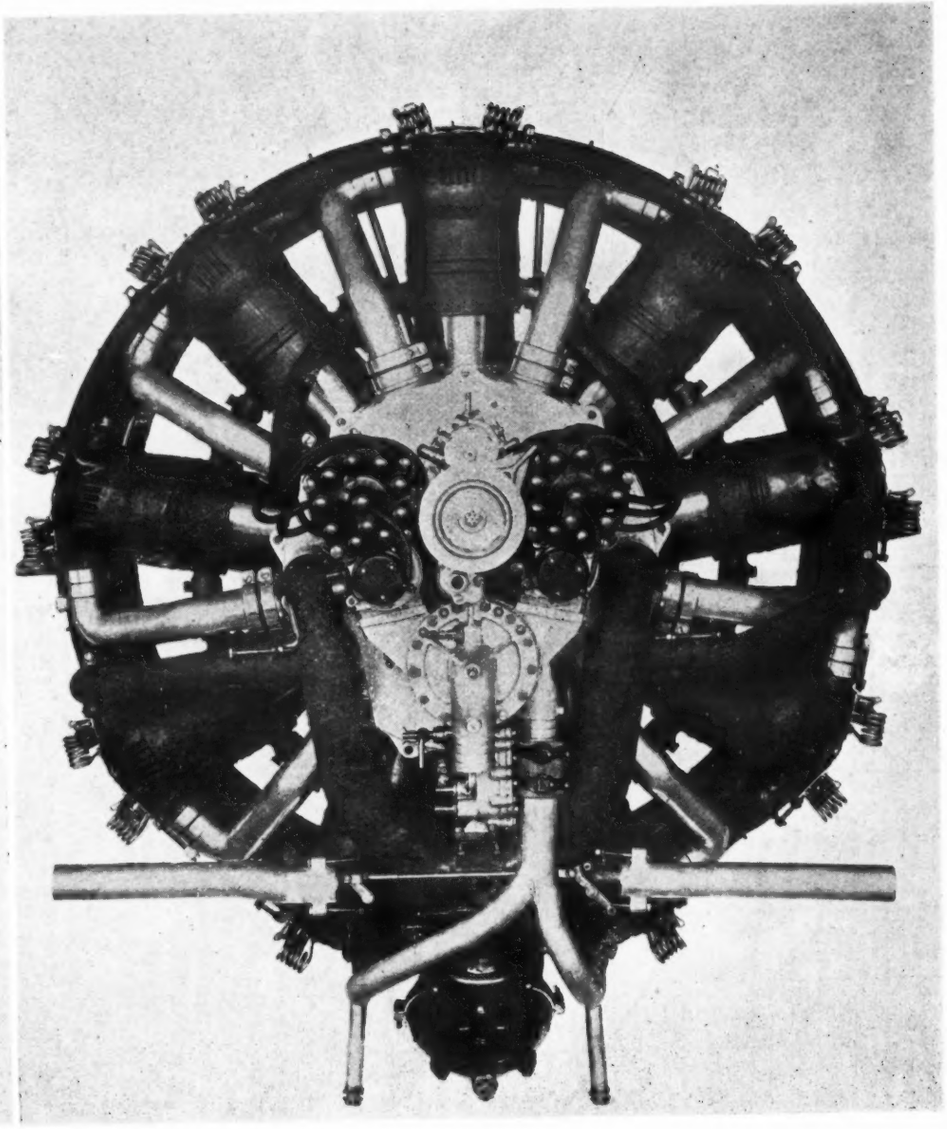
War experience has shown that the Salmson engine will render very reliable service with very little attention. When wear does set in, however, the engine usually requires complete overhauling. Unlike the vertical and V types, there are very few plain bearings capable of being renewed or relined. Ball bearings are used almost exclusively, and when these begin to show wear it is necessary to change many of the parts of the engine.

To get the best results with a star engine, the airplane should be specially designed to receive the power plant. This became so evident that before the end of the war the Salmson Company was building its own planes with a circular section fuselage to receive the engine. Only

Two Photographs of the Salmson 9 Zm Engine



Side view, showing one of the outlets of the exhaust collector and the valve spring and rocker arm arrangement



Rear view, showing magnetos, oil and water pump assemblies and intake manifolds

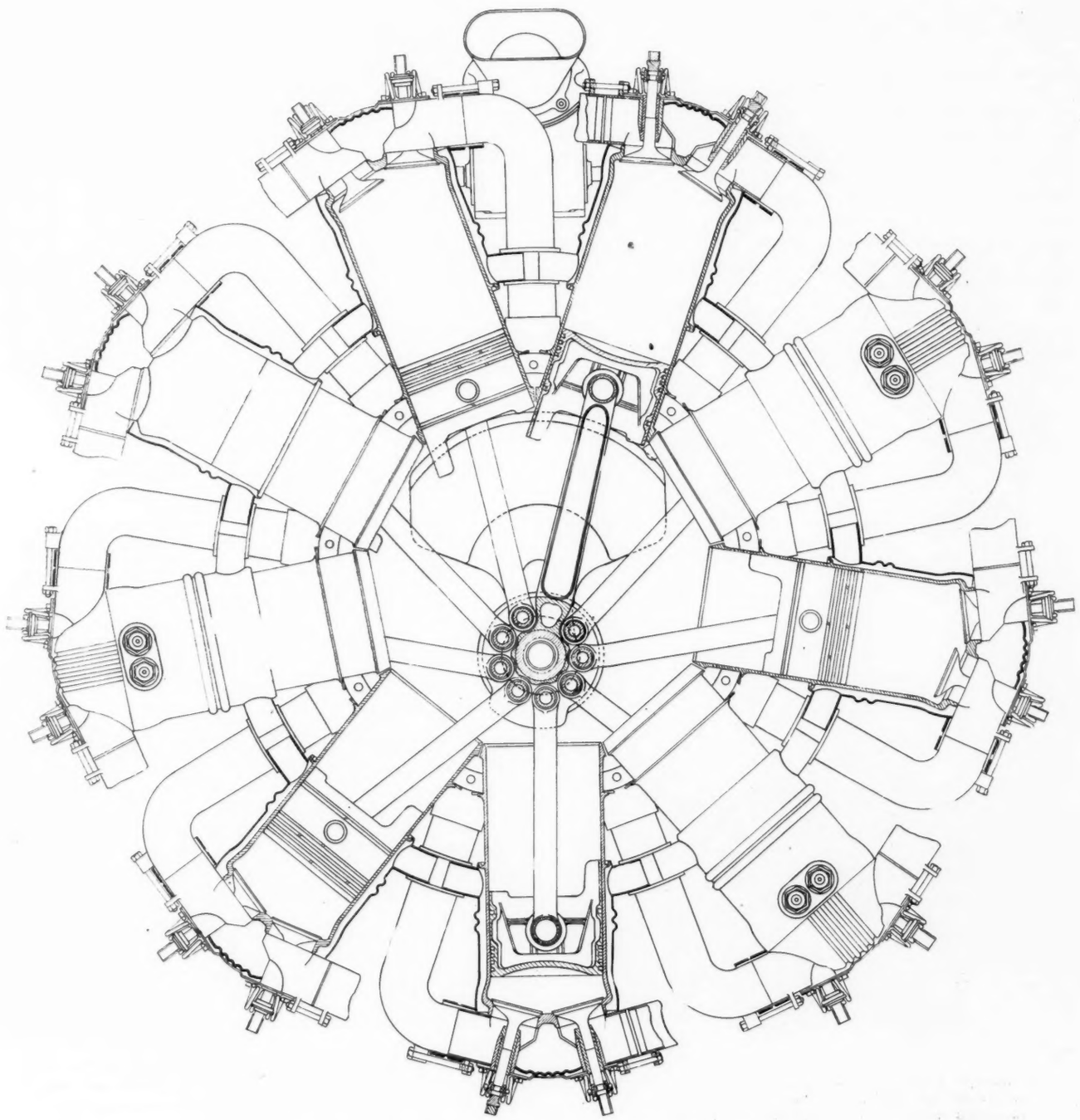
in this way was it possible to get real stream-line effect.

The Salmson in greatest production at the close of the war was the 9 Zm type, having 9 cylinders of 125 mm. (4.92 in.) bore, with a piston stroke of 170 mm. (6.69 in.). This develops 265 hp. at 1545 revolutions and gives a maximum of 278 hp. at 1650 revolutions. This power is obtained for a weight of 473 lb., exclusive of water or radiator. The weight of cooling water in the engine is 22 lb.

The crankcase of the Salmson engine is an aluminum alloy casting in two parts. It is heavily ribbed, and the two parts are united by a series of nine bolts. The nine cylinders radiate from this circular case and are secured to it by means of a couple of flanges on the cylinder base, one going inside and the other outside the base-chamber, being held in position by a split locking ring.

On the front of the crankcase there is an aluminum housing containing all the valve gear and a pocket for collecting oil coming out of the bearings. The rear portion of the crankcase has internal gas passages through which the gas is received from the external carbureter and passed to the individual intake pipes communicating with each cylinder. On the face of this rear housing there is bolted an auxiliary aluminum housing which contains the water and oil pumps, the revolution counter, and which also carries the magnetos. With this design all the valve gear is at the front of the engine, and all the auxiliaries, such as oil and water pumps, magnetos, etc., are at the rear.

The Salmson more closely approaches the rotary air-

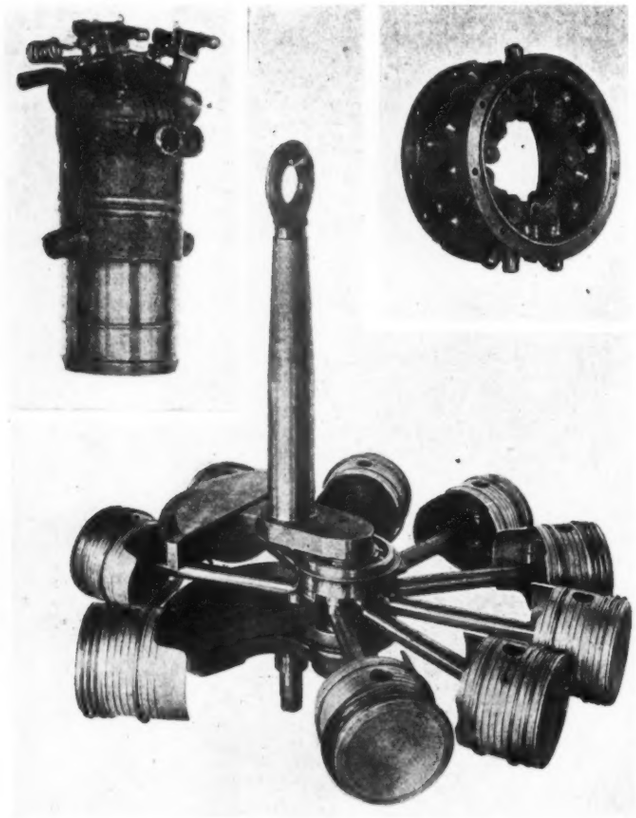


Elevation of engine, with some of the cylinders shown in section

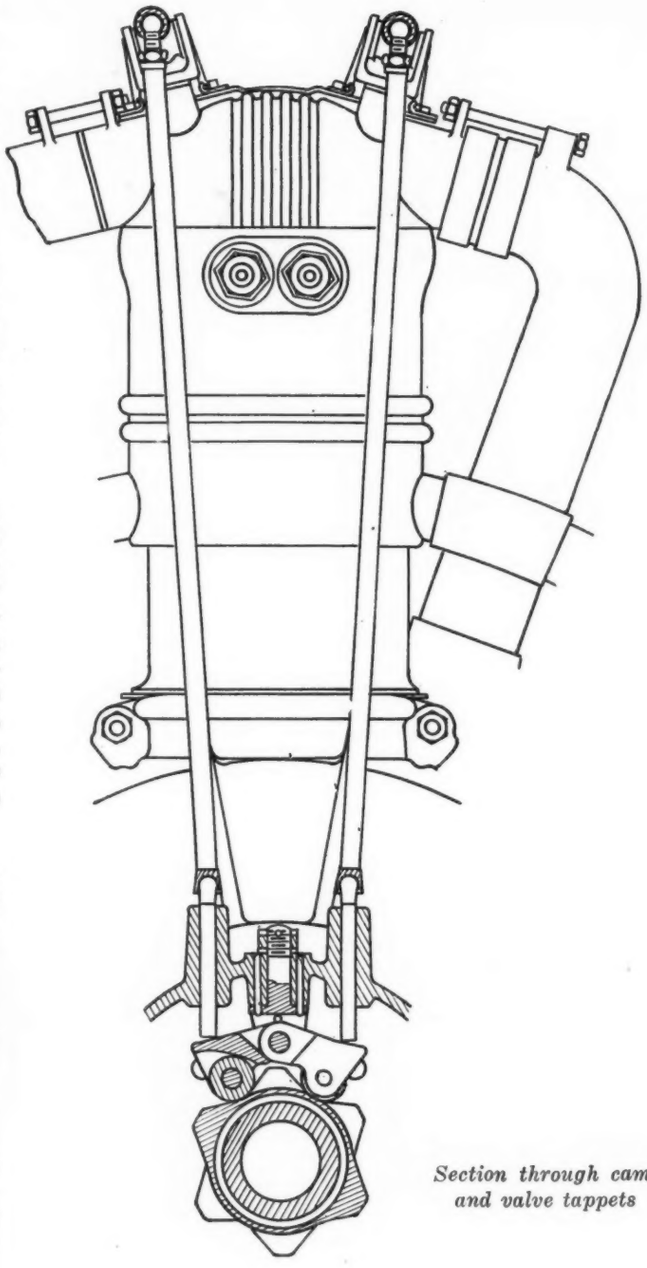
cooled than the fixed cylinder water-cooled type in its construction. Its sponsors claim that it has all the advantages of the rotary air-cooled, without any of its defects. At first sight it appears to be an engine embodying little accessibility, but a closer examination shows that so far as the parts usually requiring attention are concerned, it is practically as accessible as the average vertical engine. It is only when more than minor repairs have to be carried out that the entire engine has to be pulled to pieces.

The cylinders are steel forgings with a uniform thickness of wall of 0.137 in. The walls are not ribbed. They carry a flange, 5 in. from the base, to which the water jacket is welded. At the extreme base there is a diagonal section flange machined on the cylinder barrel, and 1.5 in. above this a second flange. The crankcase is received between these two flanges, and final locking of the cylinder is assured by means of an external split collar with lugs, the two ends of the collar being drawn together through the lugs by means of a bolt.

There are two valves per cylinder, these being inclined in the cylinder head and having a face diameter of 2.08 in. The valve cages are screwed and welded in the cylinder, the guides are bushed, and the valves are operated by means of overhead rockers. Coil springs have been abandoned in favor of a special type of valve spring, which has been in use with satisfactory results since the Salmson engine was put on the market. The water jacket is of sheet steel and in two parts; the head portion has a series of transverse ribs running between the two valves, and the barrel portion, a couple of circular ribs. Two spark plugs are fitted, being placed close together, in a horizontal position, just below the valves.



Crankshaft with counterweights, main I-section connecting rod and eight tubular auxiliary connecting rods. Pistons are aluminum with four compression and one scraper rings. Above—at right, valve tappet housing; at left, one of the cylinders

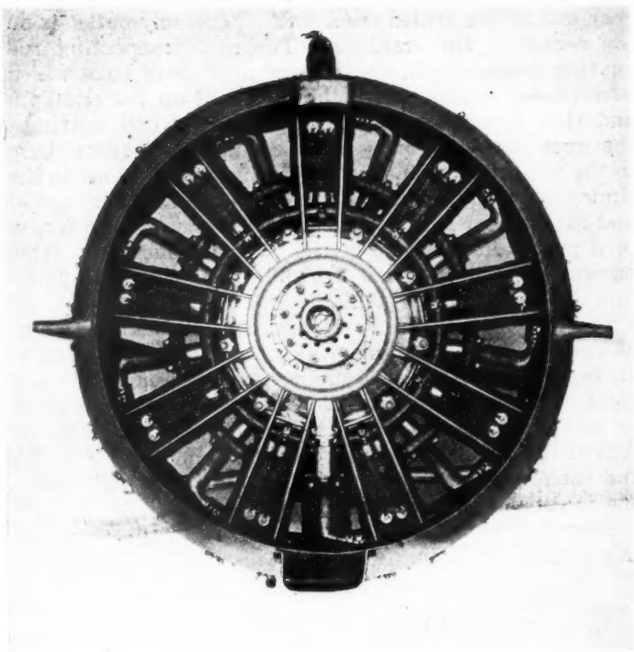


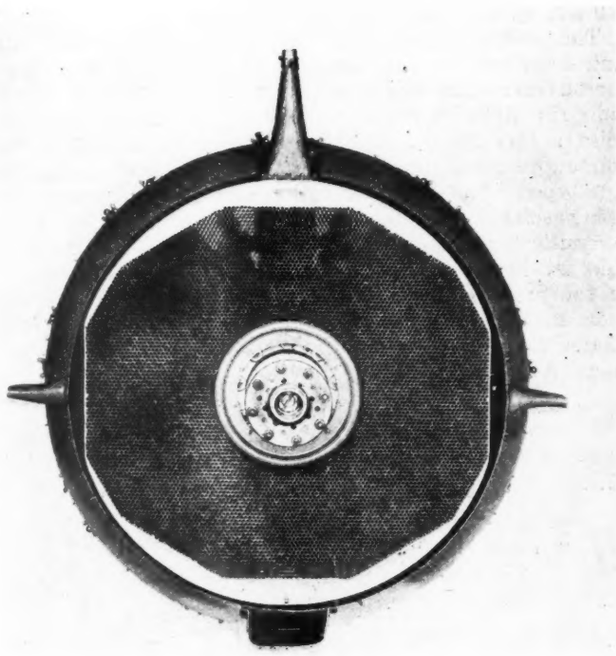
Section through cams and valve tappets

Aluminum alloy die cast pistons are employed. These have concave heads and are fitted with four narrow compression rings and one scraper ring below the wrist pin. The lower edge of the scraper ring groove is cut diagonally, and holes are drilled to allow of the return of oil to the interior of the piston. The wrist pins, which are hollow and are mounted in bronze bushes in the piston bosses, have a diameter of 1.02 in.

As in all star engines, a single-throw crankshaft is employed and is carried in ball bearings. The shaft, which is hollow, has a diameter of 2.36 in., and is in two parts, the forward portion comprising the main length of the shaft, on which the propeller is mounted, the fixed web and the detachable counterweights, and the crankpin.

The second portion comprises the rear end of the shaft and the fixed counterweight. The two parts are assembled, after the connecting rod assembly has been put in position, by means of a taper and key-ways. At its forward end the crankshaft is carried in two ball bearings;





the dimensions of the front one are 5.9 x 3.14 diameter x .94 in. in width, and of the rear one, 4.99 x 2.36 x .78 in. in width. At the rear the shaft is carried in a single radial bearing and a double thrust bearing; the dimensions of the former are 3.9 x 1.7 x 0.98 in. and of the thrust bearing 2.9 x 2.5 x 1.57 x 1.25 in.

In the Salmson engine, the master connecting rod is I-section and is mounted on the crankpin with ball bearings, the balls having a diameter of 0.78 in., and the dimensions of the ball race being 4.3 x 2.1 x 1.14 in. The eight auxiliary connecting rods are hollow, circular section, and have a length of 9.92 in. The wristpins are hollow and have a diameter of 1.02 in.

Bolted on the forward face of the crankcase is an aluminum housing containing the cams and all the valve operating gear. On the rear face of the crankchamber is another housing which receives the water and oil pumps, the magnetos, the revolution counter and the intake pipes. These two housings can be demounted without disturbing the main portion of the crankcase.

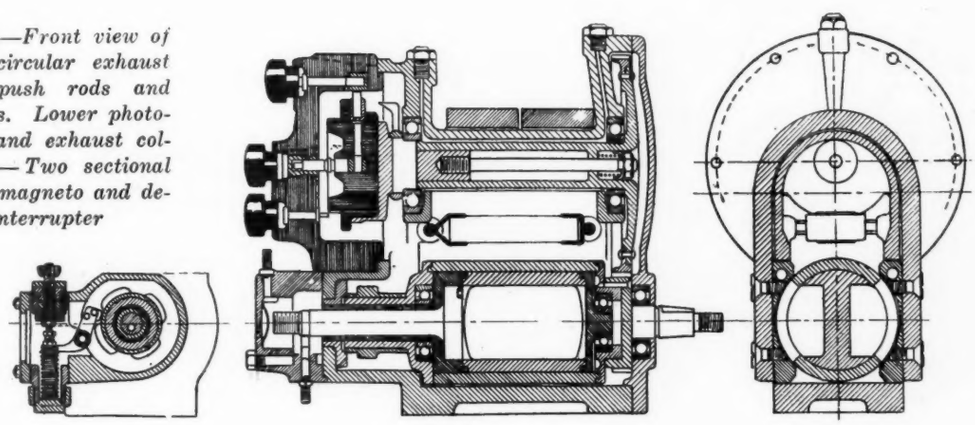
The camshaft housing is a barrel type aluminum casting secured to the forward face of the crankcase by six studs. All the valves are operated by a single cam with six bosses, the camshaft being driven off the crankshaft, and in the same direction, but at one-fourth the speed. Each boss operates successively the intake and exhaust valves of the same cylinder; two opposed bosses in the circumference of the cam are sufficient to operate three cylinders. The cam is driven by means of a pinion mounted on the forward end of the crankshaft and by a train of intermediate pinions. The cam housing carries eighteen tappet guides and the same number of spherical headed tappets. Connection from these to the overhead rocker arms is made by means of long tubular pushrods.

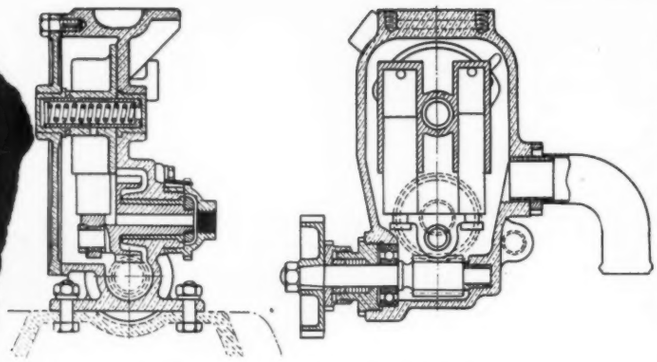
The valve timing is as follows: The intake valves open at upper dead center and close 55 deg. after lower dead center. The exhaust valves open 65 deg. before lower dead center and close at upper dead center. The ignition advance is 35 deg.

A second aluminum housing is bolted to the face of the timing gear housing. This second housing supports the crankshaft and carries the forward ball bearing of the crankshaft. When the engine is used with a tractor screw, a honeycomb type radiator is mounted around this aluminum housing. Forming a ring around the radiator is a circular exhaust collector, which receives the exhaust from the nine cylinders and discharges it through two lateral ports.

Bolted to the face of the rear crankshaft is a cast aluminum housing carrying the water and oil pumps, the two magnetos, and the revolution counter, the whole of these being demountable without disturbing any other portion of the engine.

Upper photograph—Front view of engine, showing circular exhaust collector, valve push rods and double spark plugs. Lower photograph—Radiator and exhaust collector. At right — Two sectional views of Salmson magneto and detail of its interrupter





Two sections through oil pump

The carbureter and the intake manifolds are also on the rear face of the engine. The arrangement for distributing gas from the carbureter to the cylinders is somewhat peculiar and is worth describing in detail. On the detail illustration of the crankcase, it will be seen that there are two short pipes projecting from the vertical face and nine similar pipes radiating from the circumference of this casting. The mixture is brought from the double Zenith carbureter, at the lowest portion of the engine, through a couple of exhaust jacketed intake manifolds to these two pipes and passed inside the crankchamber. This chamber has internal passages, allowing the gas to be distributed to the nine outlets, through which the mixture flows by means of aluminum pipes, with flexible joints, to the intake valves in the cylinder head.

The pump and magneto housings really form two castings. The first one, secured to the face of the rear portion of the crankchamber by means of eight studs and nuts, contains the water pump only and carries the two magnetos. The oil pump is in a separate housing bolted to the under face of the water pump housing, and capable of being demounted without disturbing the former.

The water pump is a centrifugal type, driven off the crankshaft by means of spur pinions. The water is drawn up to the center of the pump and is driven out through a pipe parallel to the inlet. This outlet pipe is forked and goes to the head of cylinders 1 and 9; passing successively through each cylinder, the two currents meet above cylinder No. 5 and are led to the radiator. There is a drain off, which empties the complete water circulating system, at the lowest portions of the pipes entering cylinders Nos. 1 and 9.

The oil pump, completely enclosed in the aluminum housing below the water pump housing, is a double piston type, one of the pistons drawing oil from the supply tank and delivering it to the bearings, and the other acting as a scavenger. Drive is obtained by means of a pinion on the water pump shaft. The oil pump shaft carries a worm engaging with a worm wheel on the crank of the two pistons. No other connecting rod is used, for the pistons, by reason of their reciprocating motion, oscillate the body of the pump and thus successively uncover the inlet and the outlet ports.

From the pump the oil is carried under pressure to the rear end of the drilled crankshaft. The only outlet is on the center of the crankpin. The main connecting rod bearing has a smooth surface and a series of holes which successively register with the oil outlet on the crankpin and thus distribute the lubricant to the ball bearings, the auxiliary connecting rod bearings, and from there to the wrist pins. The excess oil thrown out is led to the timing gear at the front of the engine and to the radial and thrust bearings at the rear. The excess is collected in a pocket in the base of the crankchamber, and after passing through a filter is drawn by the scavenging pump into the external oil tank.

Ignition is assured by means of two Salmson magnetos—this firm has undertaken magneto construction during the war—mounted on bases above and to left and right of the water pump. The magneto drive is obtained by means of spur pinions, the speed being nine-eighths that of the crankshaft. There are two plugs per cylinder, and each magneto fires a series of nine plugs; thus each one is capable of running the engine alone.

Overall dimensions of this engine are: Diameter, 46 in.; length, 33½ in.

BOOK REVIEW

Induction Coils in Theory and Practice, by Prof. F. C. Austin, E. E. Published by the author.

The author explains the theory of the induction coil and describes the functions of its different parts. Numerous examples are given of the calculation of spark coils for different purposes. All of the various types of interrupters are described and illustrated, including the commutator, mercury, hammer, atonic, Wehnelt and alkaline types. The induction coil has always held considerable fascination for the electrical experimenter, and it is evidently for the benefit of the electrical experimenter that this book has been chiefly written. The author states in the preface that the subject matter resulted largely from his experience in directing the courses in radio and buzzer training, Dartmouth Training Detachment, National Army, U. S. A.

A Nebraska farmer reports that he turned the exhaust of his tractor into a corn crib and killed a bushel of rats.

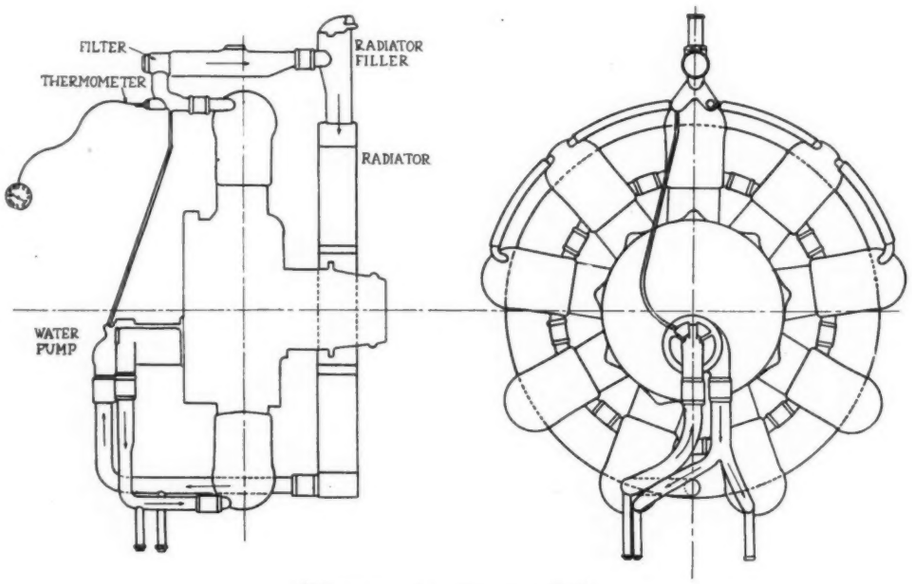


Diagram of water circulation

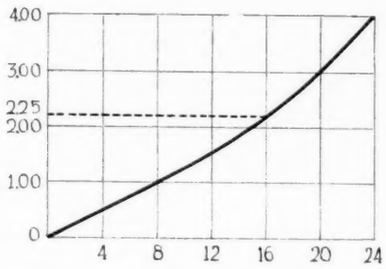
How War Department Will Revalue Used Machine Tools

Chart Is Worked Out Which Includes the Care and Maintenance of All Property

THE Machine Tool Section of the Sales Bureau of the War Department was created to catalogue and value all used machine tools left in Government ownership as a result of the cessation of the making of war equipment. This is essentially a pioneering task. No great need of such work has before existed.

The charts, printed on this page, are self explanatory. They have been devised to solve the problems of making an inventory of this material. As rapidly as the machine tools are catalogued, they will be listed with the sales office of each zone or district and for the inspection of prospective purchasers.

Reduction Factor—This chart is to be used in conjunction with the main chart to obtain uniformity of results in those cases where shops have operated at other than 8 hr. per day, on which the main chart is based.



Having determined the number of hours per day at which the tool was operated (A2), read from this number on base line vertically to curve, then horizontally to the side for the reduction factor.

Example: The machinery in the plant was operated for a period of 1½ yr. (A1) at 24 hr. per day (A2).

Method of Application: From the chart the factor is found to be 4.00 for 24 hr. use. Multiply the period of actual use, 1½ yr., by factor 4.00. Result, 6, which is the equivalent number for years on 8 hr. usage and is the time to be used in reading the main chart.

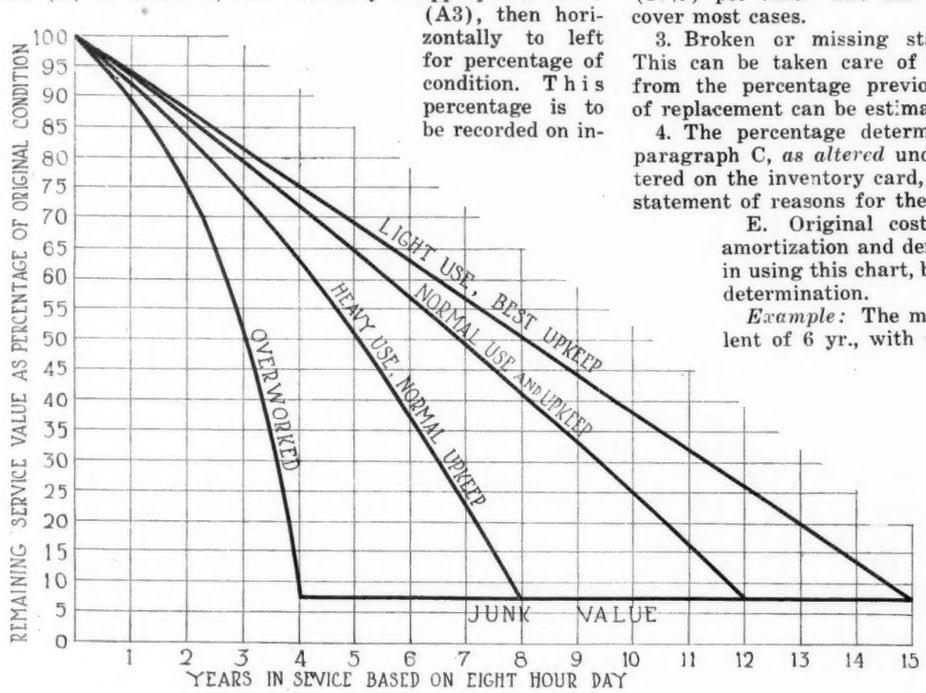
Chart for Use in Appraisal of Standard Machine Tools to Determine Service Value

A. In using this chart, ascertain from best sources, as completely as practicable, preferably from shop superintendents, foremen, U. S. inspectors, or plant records, for each tool or group of tools:

1. Actual time of use in years;
2. Average number of hours per day in use;
3. Class of usage and upkeep (see curves below).

B. Reduce the actual time of use (A1) to the equivalent standard 8 hr. day usage by the reduction factor obtained from small chart.

C. Enter main chart below with equivalent years of use (B) on base line, read vertically to appropriate curve (A3), then horizontally to left for percentage of condition. This percentage is to be recorded on inventory card unless altered in accordance with paragraph following (D).



D. Examine the tool for evidences of:

1. Exceptionally good care, maintenance and operation, above normal. If justified, the percentage derived under preceding paragraph (C) may be increased, but not to exceed five (5%) per cent.

2. Abuse or exceptionally poor care, either in usage, upkeep, handling or storage, below normal if justified, the percentage derived from preceding paragraph (C) may be decreased, but, in general, not more than ten (10%) per cent. The use of the *overworked curve* will cover most cases.

3. Broken or missing standard parts or equipment. This can be taken care of by an appropriate reduction from the percentage previously determined, unless cost of replacement can be estimated with reasonable accuracy.

4. The percentage determined by consideration under paragraph C, *as altered* under paragraph D, is to be entered on the inventory card, and noted in "remarks" with statement of reasons for the exercise of special action.

E. Original cost, market price, obsolescence, amortization and demand are not to be considered in using this chart, but as separate factors in price determination.

Example: The machine was in use the equivalent of 6 yr., with *normal use* and *below normal* upkeep.

Method of Application: Enter the chart along base line at 6, follow vertically to "normal use and upkeep" curve; read horizontally to left, to 57%. By use of judgment under D2, it is determined that 5% should be deducted; 57% less 5% gives 52%. Entry on card, "condition 52%"; in remarks, "normal use, 5% deducted for below normal upkeep."

How American Ingenuity Designed the NC Boats

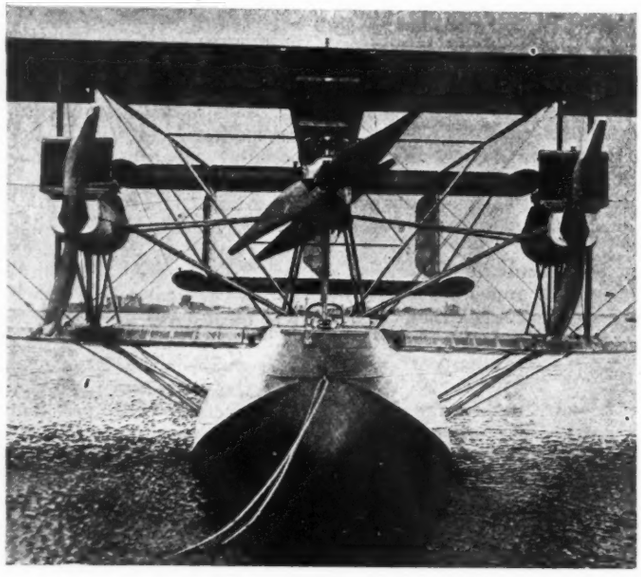
This is the real story of the development of the NC boats, told by a man who was an important link in the chain—To him was given the order in the abstract to devise a plane that could fly across the Atlantic to avoid delivery troubles—He tells how this was accomplished

By Commander J. C. Hunsaker*

WITH aircraft, as with battleships, destroyers and all men-of-war, the types used by the United States Navy have come to be known as distinctively American types, although the military problem solved by each type is usually not distinctively American.

This result has to a large extent come about through a natural American prejudice against copying features of design and construction with which we are inexperienced. This prejudice is, of course, a stimulant to originality, but must be tempered by good judgment or good engineering, which is the same thing. A constructor, while he should very properly hesitate to copy practices he only half comprehends, must at the same time be quick to recognize the merits of a foreign development and to adapt or adopt its good features in his own work.

During the war the Navy selected only one foreign seaplane type to be copied in the United States. This was the British Admiralty's flying boat, F-5, plans of which were brought to the Naval Aircraft Factory early in 1918 when the factory was going in full production on the H-16 flying boat, a Curtiss development.



Engine location in NC boats

Production was shifted over to the new model with considerable trouble and delay because it had a superior bomb capacity and air endurance. But as soon as a start was made to prepare the necessary production data for the factory and its subcontractors, it was realized that very material changes would have to be made. In fact, before the boat was finally got into production it resembled the British prototype only in externals. The changes made can be classified under these heads:

(1) Change of powerplant installation from Rolls-Royce to Liberty, involving new oil, water and gasoline systems and starting arrangements.

(2) Change of design of all metal parts and fittings to permit use of American practice in metal stamping machinery and to eliminate hand work.

(3) Change of design of all pins, nuts and bolts to American standards.

(4) Change of controls in boat from single to dual to meet demands of American flyers.

(5) Change from unbalanced to balanced ailerons to ease up load on the pilot.

(6) Change of bomb racks and gear for American equipment.

(7) Change of internal hull construction from British practice with ribs to American practice with longitudinal stringers.

(8) Substitute laminated struts and wing spars for solid types to save spruce.

(9) Change bottom planking and step construction to American practice.

(10) Change system of covering wings to American practice, using cotton instead of linen.

(11) Strengthen tail where it appeared weak.

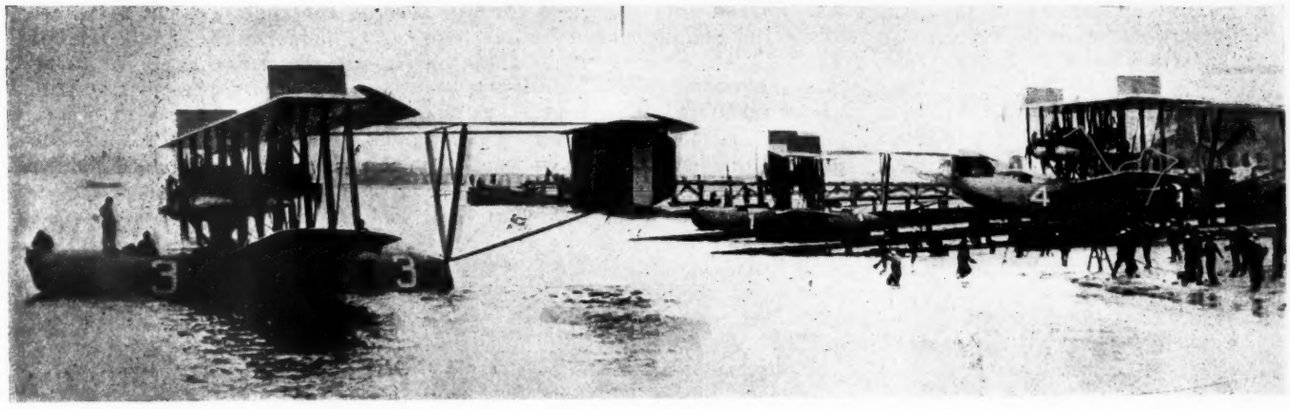
(12) Remake all plans to permit quantity production of interchangeable parts assembled from a multitude of subcontractors.

The American theory of manufacture is to assemble parts procured from separate makers or departments if all are made in the same plant. To apply this theory of manufacture the design has to be prepared accordingly. Also we have American practices, standards and special materials to be looked out for. Some of these special practices and materials are common to both Army and Navy and represent industrial development, but a great many are peculiar to the Navy alone and have been arrived at as the result of experience or research.

The Navy with aircraft, as with ships, does the greater part of its own designing and building through its Corps of Naval Constructors. At the same time, private design and construction are encouraged by contracts with builders which lodge engineering control in the Navy Department.

The NC flying boats, whose very recent transatlantic performance is too well known to be gone into here,

*Bureau of Construction and Repair, Navy Department. Paper presented at the Summer Meeting of the S. A. E.



Start from Rockaway, N. Y., of the Navy seaplanes NC 1, 3 *and* 4

represent a typical example of how the Navy operates on the engineering side. Their design and construction made use of available talent both in and out of the service, the facilities of parts makers and the new materials developed during the war, and, in general, represent the result of organized engineering rather than invention. For this reason no one man can be said to have designed these craft, although the Chief Constructor of the Navy, Admiral Taylor, was at all times responsible for ways and means and results as well as the initial conception of the project.

The NC flying boat is, as I say, typical of Naval practice, and in describing it I can give some idea why it is a distinctively American type and some account which may be interesting to engineers of any new processes and materials used.

In the same way the airship or dirigible C-5 is a distinctively American type, and while I regret that we did not succeed in crossing the Atlantic with it, the flight from Long Island to Newfoundland proved the possibilities from an engineer's point of view. It appears certain that had we set out with three airships, as we did with three flying boats, to make the "big hop across," at least one would have made it. The design and construction of the C class airships made use of organized engineering, just as did the NC project, and in describing it I could cover the wartime development in airship construction of the Navy. However, to do so would make this paper too long and I shall confine myself to heavier-than-air craft.

The development of really large flying craft before 1917 was held back because no suitable engine had been designed. Several attempts, both at home and abroad, had resulted in failure, notably the Curtiss giant triplane and the Sikorski, both land machines. When the 350-hp. Rolls-Royce became available, the four-engine Handley-Page was brought out in England, but in the United States no American engine was in sight until about August, 1917, when the preliminary work on the Liberty began to look promising.

Admiral Taylor, as a member of the Aircraft Board, was in a position to weigh the evidence as it came in and to foresee the ultimate success of the new engine. This engine, then known as the "United States Motor," was still under a cloud of unfavorable comment from foreign and domestic experts, but the early troubles were recognized as natural and inevitable and the chance of success looked good.

About this time the German submarines were extremely active and successful and there were grave doubts of there being shipping available to transport to Europe the great tonnage of American material necessary to prosecute the war. In particular, one of the weapons needed to keep down the submarine was the flying boat, and unless we had a great number of flying boats on patrol over the European submarine-infested areas the shipping space available would be rapidly diminished, and unless there was shipping space the flying boats could not get over. It was a vicious circle and could be broken only by flying the boats across the Atlantic under their own power. For 1918 we had a large program of flying boats which were indeed large, but not quite large enough to be flown safely across the Atlantic. In 1919 we needed something bigger, and to prepare for quantity production, the experimental models would have to be brought out in 1918.

The Beginning of the NC Boats

The first step to provide the transatlantic boats was the following memorandum:

Washington, D. C.,
Aug. 25, 1917.

From: D. W. Taylor, Chief Constructor, U. S. N.
To : J. C. Hunsaker, Naval Constructor, U. S. N.

The "United States Motor" gives good promise of being a success, and if we can push ahead on the aeroplane end, it seems to me the submarine menace could be abated, even if not destroyed, from the air. The ideal solution would be big flying boats or the equivalent, that would be able to keep the sea (not air) in any weather and also able to fly across the Atlantic to avoid difficulties of delivery, etc.

Please think it over very carefully, particularly as to the method of procedure to develop something as close to the ideal as possible.

Design studies were at once put in hand and from time to time various men were called in consultation with the regular design staff of the Bureau of Construction and Repair. Ideas and suggestions from all sources were considered, and the design itself became a composite of ideas, these being chosen and incorporated into the design on the basis of suitability and merit and without any reference to their source.

Plans were then prepared in the Bureau for a boat of this character to be fitted with three engines and for one to be fitted with five engines. The predicted performance was computed for each boat from which it appeared that the three-engine boat could be made to satisfy the general requirements of the problem and could be built much more quickly and with smaller risk of failure. Admiral Taylor accordingly directed that the design staff of the Bureau be put on the plans of the three-engine type. Investigations were at once undertaken to determine in a preliminary way the construction of wing beams, struts and the principal structural members, the proportions of wing area, fin and control surface areas and the materials to be employed for important parts.

The general appearance of the design was worked out and the procedure to be followed in making the detail drawings established.

A 3-ft. model of the design was then made exactly to scale and tested by Dr. A. F. Zahm in the wind tunnel of the Washington Navy Yard. From his investigations of the forces of this model when held in a 70 mile per hr. artificial wind, the size and arrangement of tail surfaces needed to guarantee stability and correct balance in flight were determined. With a machine of the unprecedented size contemplated, it was vitally necessary that there should be no doubt on this score, as an accident on the trial flights would set the project back many months besides risking the lives of the crew.

The design being worked upon was of dimensions far beyond any previous experience in this country, indicating that much unfamiliar territory would have to be covered. New methods of construction would be required that the design might be successful, as, otherwise the weight of the design would increase with such rapidity as to make success impracticable. In the state of design information as it existed in the United States on that date, this necessity was one of the greatest seriousness and one which imposed upon the personnel connected with the design a great amount of investigation and experimentation in the working out of the details referred to.

It soon became apparent that the carrying on to the completion of design work of such dimensions at the Bureau of Construction and Repair in Washington would be impracticable, unless the entire facilities of that Bureau were devoted to this work. Under the enormous pressure of air matters connected with the war which had devolved upon this Bureau, in common with the other bureaus of the Navy Department, this was impossible and it was accordingly decided to arrange with the Curtiss Aeroplane & Motor Corporation, Buffalo, N. Y., to complete the drawings with their own design facilities. and with the contribution by themselves of such ideas of value as might develop under the control and supervision of the Bureau.

Completion of Design

A contract was, therefore, made with the Curtiss company for the performance of this, the drafting and design work. Under the terms of this contract it was to carry out all work directed by the Navy Department, furnishing in connection therewith all facilities necessary. The Bureau of Construction and Repair reserved to itself the direction and oversight of all work coming under that Bureau and, for this purpose, placed in charge as its field representative, Naval Constructor G. C. Westervelt, whose headquarters were at the plant of the Curtiss Aeroplane & Motor Corporation in Buffalo. Active work on the detail design was begun at Buffalo early in October. Shortly after the commencement, Naval Constructor H. C. Richardson was ordered for duty in connection with the design of the hull.

In carrying on the actual work of design, the design as a whole was first divided into its main elements. These main elements were designed or approved by the Bureau of Construction and Repair and the various details of these were then distributed to the members of the design force at Buffalo working upon them. All ideas, whether of the Curtiss Company or of the Navy, were pooled, and as details were worked out the decision to accept them was made as a result of discussion.

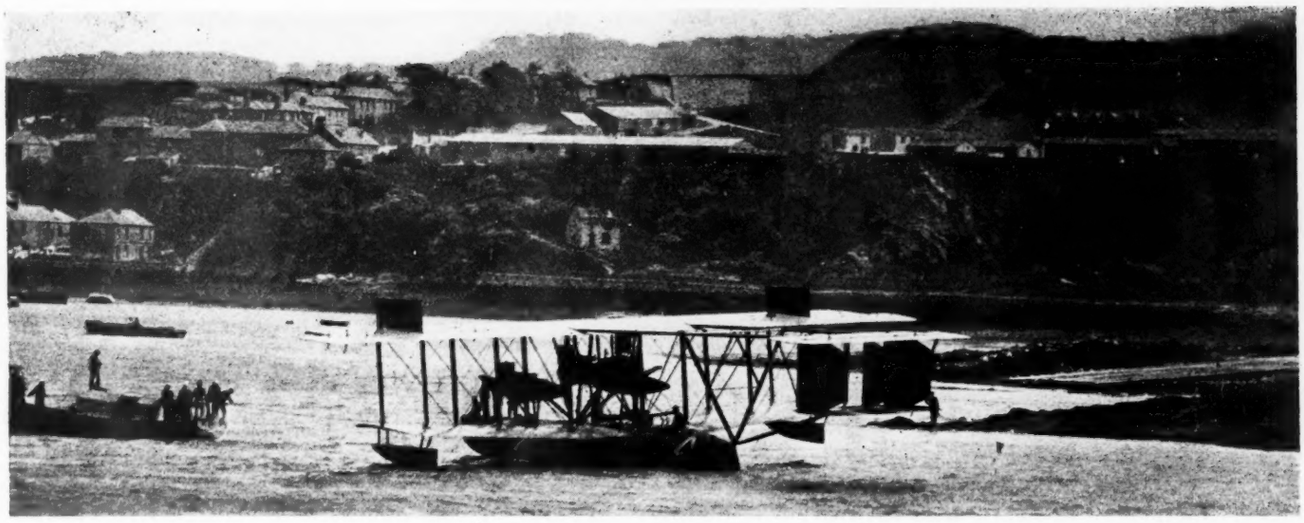
The flying boats were designated NC. N for Navy and C for Curtiss, indicating the joint production of the Navy and the Curtiss Engineering Corporation. Being designed for war service, the boats are not at all freak machines put together to perform the single feat of a record-breaking flight but are rugged and comfortable craft designed and built in accordance with standard Navy practice. The NC-1 was in service 7 months and had rough handling when the new pilots for the other NC boats were trained on her, but was in good condition to start for the Azores and, considered all round, was the best boat of the four.

The term flying boat is used for the NC type because it is actually a stout seaworthy boat that ploughs through rough water up to a speed of 60 miles per hr. and then takes to the air and flies at a speed of over 90 miles per hr.

The hull or boat proper is 45 ft. long by 10 ft. beam. The bottom is a double-plank V with a single step somewhat similar in form to the standard Navy pontoon for smaller seaplanes. Five bulkheads divide the hull into six watertight compartments with watertight doors and a wing passage for access. The forward compartment has a cockpit for the lookout and navigator. In the next one are seated side by side the principal pilot or aviator, and his assistant. Next comes a compartment for the members of the crew off watch to rest or sleep. Aft of this there are two compartments containing the gasoline tanks where a mechanician is in attendance and finally a space for the radio man and his apparatus. The minimum crew consists of five men, but normally a relief crew would be carried in addition.

The hull is designed to have an easy flaring bow so that it can be driven through a seaway to get up the speed necessary to take the air and a strong V-bottom to cushion the shock of landing on the water. The combination of great strength to stand rough water with the light weight required of anything that flies was a delicate compromise, and it is believed that a remarkable result has been obtained in this design. The bare hull, as completed by the yacht builder and ready for the installation of equipment, weighs only 2800 lb., yet the displacement is 28,000 lb., or 0.1 lb. of boat per lb. of displacement. This lightness of construction was attained by a careful selection and distribution of materials. The keel is of Sitka spruce, as is the planking. Longitudinal strength is given by two girders of spruce braced with steel wire. To guarantee watertightness and yet keep the planking thin, there is a layer of muslin set in marine glue between the two plies of planking.

The lines of the hull mark an important advance in the design of planing bottoms. In the early flying boats it was considered necessary to have great width to make the boat plane at reasonably low speeds. A usual rule has been to allow not over 100 lb. of displacement per inch of width. Sometimes, to get more width of bottom, side fins or pontoons were built out from the main hull, as in the F-5, H-16 and HS-1. In the NC hull the radical step was made of getting planing by speed rather than by width. The NC boats at the start from Newfoundland got off with a 233-lb. load per inch of width of planing bottom. This is possible because of the easy lines of the after body which permit a speed on the water up to 65 miles per hour when all engines run at full speed. Running at this rate, it is very important that the pilot have control of the fore-and-aft attitude of the boat. This he can do by rocking the boat with his elevators. To permit such rocking while planing at high speed is a rather delicate design problem. With a two or more step hydroplaning bottom, the boat planes on at least two steps and hence is fixed in attitude so that there is nothing the pilot can do to change it. With a single deep step the boat gets up on this step and is quite unstable except



NC 4 at Plymouth

for the air controls. Unless the pilot is expert he may get into difficulties, especially in a swell. The NC hull has a short distance back of the center of gravity a single deep step on which the boat can be rocked by the pilot after he gets up to planing speeds, but until sufficient speed is established to make the air controls effective, the stern of the boat is also planing on the water and acts somewhat as a second step to hold the boat in a reasonable attitude. The form of this stern is novel and constitutes an important improvement in the design of flying boats.

The tests of the model hull in the towing basin at the Washington Navy Yard showed that the boat got up to speed quickly if trimmed about 8 deg. by the stern. In practice the pilots have verified this "optimum trim" and at the start let the boat run at this designed or natural trim until it rises to the surface of the water and begins to plane. The trim is then reduced to 6 deg. to lessen the air resistance of the wings and keep down the lift so that the boat will stay on the water until the air speed meter indicates that flying speed is attained. When this rate is reached the pilot watches the sea and "waiting for a smooth time" pulls back the elevator column to increase the angle of incidence of his wings to about 15 deg., or a trim of boat of about 12 deg., to lift himself into the air. A feature of the NC hull is the ability to be pulled back in this manner and to keep on the water without "porpoising" until adequate speed is reached. Once in the air, it is necessary to stay there and not bounce back on the sea, subjecting the boat to abnormal shocks. Due to the pointed form of stern, when the pilot pulls up his elevators the point of the stern is pressed down into the water, thus increasing the trim.

Hull Typical American

The NC hull construction is peculiar to American naval practice from the use of a longitudinal framing system developed from experience with pontoons for seaplanes. The boat is divided into watertight compartments by transverse strength bulkheads of two-ply planking riveted together over a layer of cotton fabric set in marine glue. This construction had been found to be light, strong and to retain watertightness even when distorted or strained due to the peculiar property of the marine glue of remaining soft and sticky. Such planking is our practice for bulkheads, inner and outer skins of boat hulls and wherever watertightness is desired.

The object of the glue and fabric is to provide a waterproof film that will remain permanently flexible and sticky and at the same time seal up the holes made in the planking when the two layers are fastened together with innumerable brass or copper tacks. It was found soon after hostilities began that the type of marine glue which had previously been used for this purpose was almost unobtainable, since it was all made abroad. The American production of this product was necessary and the Bureau of Construction and Repair established certain standards or requirements which have been successfully met by American manufacturers. The requirements of a satisfactory glue are many; for instance, it should be of a non-drying nature and must remain perfectly soft, flexible and sticky. If it contains too large a quantity of volatile solvent rapid drying will be effected and hardening of the glue will result, with consequent separation of the layer of planking. It must also be resistant to salt water and must not foam up and exude between the piles when subjected to long-time immersion. After the glue is applied a short time is allowed before the hull is painted. The varnish and enamel is then applied. Marine glues are usually composed of a mineral gum, shellac, pine tar, cellulose lacquer or rubber dissolved in the necessary solvents to the consistency of molasses.

The tail in the NC is unique and resembles no other flying machine or animal. The tail surfaces are made up as a biplane which resembles in general appearance and size the usual airplane. Indeed, this tail of over 500 sq. ft. area is twice as large as the single-seater fighting airplanes used by the army. This tail structure is supported by three hollow spruce booms braced by steel cable in such a way as to remain clear of all breaking seas and to permit a machine gun to be fired straight aft from the stern compartment without interference. The method of support is a radical change from former American and foreign practice but has resulted in several advantages besides an important saving in weight.

The tail surfaces were proportioned after extensive wind-tunnel tests at the Washington Navy Yard and the area and settings adjusted to give correct flying balance and inherent longitudinal stability. The horizontal stabilizers are inclined 1 deg. to the chord of the wings. This angle has been found on trial to give a very easy balance, and running along at normal speed the boat practically flys herself in good air, requiring no work by the pilot. Naturally, in bumpy air the pilot has something to do, but due to the great inertia, bumps which

would toss an ordinary machine about are barely felt. The boat is inherently stable to such a degree that if disturbed from normal flying attitude by any cause it will return to it without the intervention of the pilot. At the same time the controls are powerful enough to overcome the inherent stability so that the pilot is able to handle the boat in the usual manner. Naturally, in a boat of such size, quick maneuvering is not possible, and for this reason the usual factors of safety were cut down in a most radical manner. The results have justified the conclusions arrived at as to factors of safety based on purely theoretical considerations.

To insure easy operation, each control surface was carefully balanced in accordance with experiments made in the wind tunnel on a model of it. The operating cables were run through ball bearing pulleys and all avoidable friction eliminated. Finally, the entire craft was balanced so that the center of gravity of all weights came at the resultant center of lift of all lifting surfaces. There is provision, however, for an assistant to the pilot to relieve him in rough air if he becomes fatigued or wishes to leave his post to move about the boat. The matter of providing a servo-motor was at first thought worth going into, but on trials the controls were found to be so easy as to make it unnecessary to provide for power operation. A British type of servo-motor had, however, been imported and fifty units made and issued to the service for trial. Some of the twin-engine boats have been found heavier on controls than the NC and good results have been had using servo-motors on them.

The standard Navy practice is to design tail surfaces for a load of 20 lb. per sq. ft., but on the NC the horizontal stabilizer is designed to fail under a load of 13.5 lb. per sq. ft. The vertical fins are designed for 7 lb. per sq. ft. load and the rudders and movable surfaces for 10 lb. The main wing girder when loaded to 28,000 lb., the maximum permissible overload for start of the transatlantic flight, has a general factor of safety of 3, as against 6 for ordinary seaplanes and 8 to 12 for pursuit land types. No evidence of structural weakness has developed so far, but of course in designing for such low factors of safety the greatest care has been taken in the selection of material and the structural calculations.

Use of Spruce Parts

In the last few years we have learned considerable about the mechanical properties of spruce and now use it with confidence where before we employed it only after careful consideration and the allowance of a very liberal factor of safety. In the NC spruce was used wherever possible for tail booms, wing spars, ribs, struts and internal hull work and wherever bending was unnecessary.

The knowledge of the mechanical properties of spruce which we now have and which enables us to use straight engineering calculations, is due principally to three things: First, the research data of the Forest Products Laboratory; second, the experience of our own inspectors and builders in selecting sound and uniform timber; and third, the knowledge gained by experience which enables us to employ the wood in laminated and spliced form.

In the study of the effect of moisture content of wood it was found necessary to season it artificially in a dry kiln and to run the seasoning process as carefully as the heat treatment of steel. The wood when seasoned should be sealed up at once by varnish to prevent warping and checking. In our usual quantity manufacturing method, wood parts cannot be used at once and must be kept in stock a rather indefinite period before they are wanted in the assembly operation. It is not practicable to varnish many parts before assembly, especially where glue is to be used. A solution of the difficulty was found at the Naval Aircraft Factory, where humidity control of the air of the entire plant was incorporated in the heating and ventilating system. Such a system has been used in cotton mills, but is believed to be new in a woodworking or aircraft factory. The results have been most successful and fully justified the additional outlay. Wood parts cut to fit can be stored in the shop for a considerable period of time and when finally assembled go together perfectly.

The work of the Forest Products Laboratory has swept away the mystery which formerly surrounded attempts to use wood as a material of engineering construction. The relation between the density, moisture content and strength of the wood is now understood. The usual defects such as pin knots, spiral grain, etc., have been analyzed and their effects taken account of in establishing tolerance tables for any given design of plane. Naturally, for the NC where the factor of safety had been reduced to a minimum it was necessary to use absolutely clear, straight stock of correct density. To insure faultless material it is much easier to use laminated and spliced work where more thorough inspection of each part can be given.

Details of Wings

The wings are of a curvature known from experience to be efficient, designated as R. A. F. 6, and carry a load of 11.7 lb. per sq. ft. in the air, but the structural weight is only 1.2 lb. per sq. ft. The total area is 2380 sq. ft. Wings of this size could not be constructed by the usual methods and materials without exceeding this figure considerably and a great amount of research and experiment has been necessary to determine the best disposition of material to adopt.

The main wing spars are hollow spruce boxes. Each rib is a truss designed like a bridge consisting of continuous cap strips of spruce, corresponding to the upper and lower chords of a bridge truss, tied together by an internal web system of vertical or diagonal pieces of spruce. The ribs are 12 ft. long, but only weigh 26 oz. each. On test these ribs were required to carry a proof load of 450 lb. of sand for 24 hr. without damage. An interesting detail of the wing construction is the hinged leading edge which encloses the control cables to the ailerons or wing flaps. This eliminates the air resistance of these cables, but at the same time they are accessible for inspection by merely swinging up the leading edge on its hinges. The wings are arranged as a biplane with the necessary struts and wires to give girder strength. For lightness the struts are made up as a spruce box, but to decrease resistance this square portion is enclosed in a fish-shaped fairing or "stream line" of stiff fiber. To reduce any tendency of the struts to bow under load, the middle points are connected with a steel cable. The diagonal bracing between wings is by steel cables in pairs. These cables are arranged to lie one behind the other with a spruce batten between to reduce air resistance.

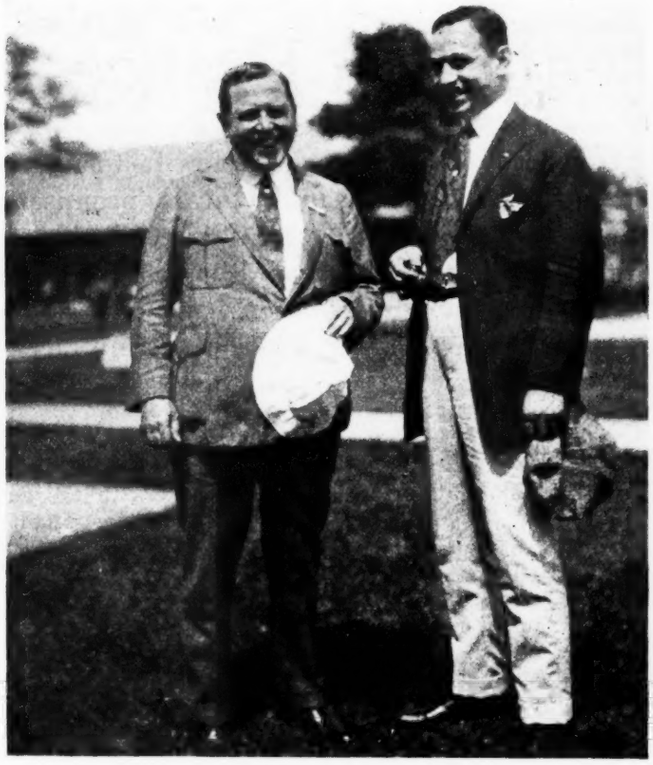
(To be concluded)

Italian Show Postponed

THE Italian Automobile Manufacturers' Association has decided to hold no automobile shows in Italy during the year 1919. This decision has been taken in view of the large amount of work to be carried out in transforming the industry from a war to a peace basis. It is probable, however, that the leading Italian makers will exhibit at the Paris and London shows, to be held toward the end of the year.

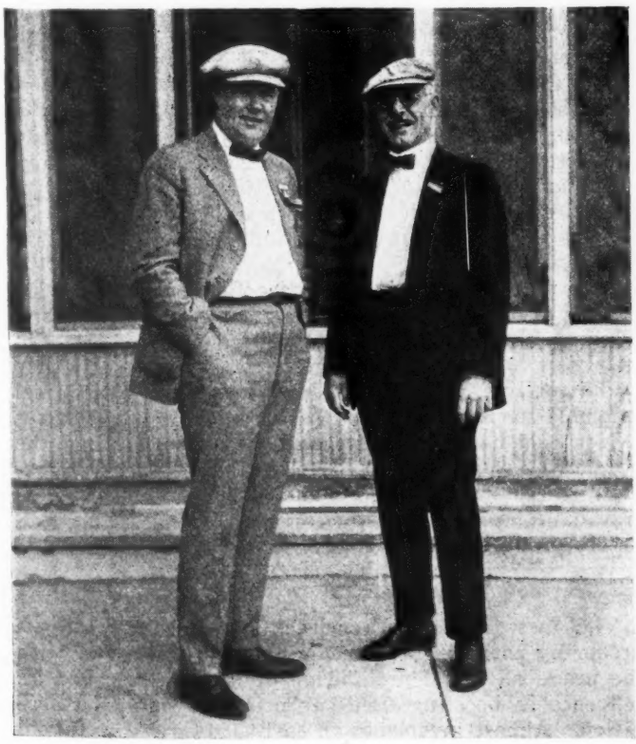
More Snapshots from Ottawa Beach

F. E. MOSCOVICS,
Chairman of Nominating Committee and Humorist



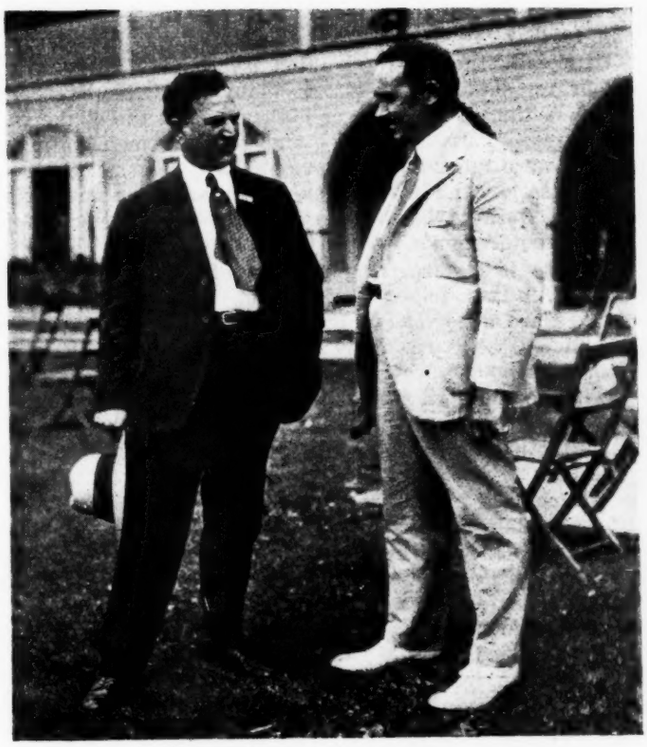
A. R. MOSLER GEO. MARGOLUM
The Spark Plug Men

GEORGE P. DORRIS,
Of St. Louis, Elected a Member at Large



GLEN A. SANFORD
Sales Manager Jackson Rim Co.

A. D. TREMPE
Rim Service Manager United Motors Service



WEBB JAY
The Stewart Vacuum Tank Man

GEORGE WEIDLEY
Of the Weidley Motors Co.

Queer Phases of the Automobile Situation in France

Strike stops production in all but a few factories.
Production is not up to manufacturers' promises.
Former owners pay big increase for requisitioned cars.
Weird tales of sales of American Army cars.
Wealthy people drive buses during transport strike.
Salvaged cars in an exciting American Army race.

By W. F. Bradley

PARIS, June 13.

THE whole of the French automobile and aviation factories are now closed by reason of the engineers' strike. When this dispute started in the general engineering trade, the automobile factories were not particularly concerned, and a certain number of the shops kept open despite the orders to come out. Among these were Delage, Anzani, Scap, and Citroen. The strikers, however, broke into the shops and persuaded the men who were at work to thrown down their tools.

It is very difficult to get a straightforward statement of the men's grievances. While the application of the 8-hr. day is made the excuse for the strike, very large numbers of men admit that they have no personal grievance. It is to be observed, too, that in a very large number of the French automobile factories the 8-hr. day was in regular operation before the strike was declared.

Officially the workers' union is claiming 63 cents an hour for skilled workers. In many cases they were receiving this rate of pay, or higher, before the strike was declared. Pattern makers and foundry men in many cases were receiving $1 an hour. This can be justified, doubtless, by the law of offer and demand, the number of skilled workers in these branches being insufficient to meet requirements.

There is a surprising absence of bitterness against capital in this strike. The men fully recognize that their wages are abnormally high. Up to 1914 a skilled mechanic in the Paris district rarely earned more than 23 cents an hour. Now he gets from 60 to 70 cents, but owing to the high cost of living he is no better off than he was 5 years ago. There is general and legitimate dissatisfaction at the high and increasing cost of all necessities of life.

Employers frankly recognize that the men have cause for complaint because of the shrinking purchasing value of their money. One big automobile manufacturer with whom I spoke to-day stated that if the strike did nothing more than force the Government to action on this question of the inflated price of commodities, it would have been justified.

While an increase was to be expected, there was no reason why living should be much higher in France than in England or Belgium. The statement has been made that these strikes have been fomented by German influence and money. Whether this is true or not remains to be proved. It is a fact, however, that the great mass of the workers in the automobile and aviation industries are quite free from any Bolshevic tendencies and are anxious to obtain normal and satisfactory working conditions.

Few Cars Produced

These labor disputes have had a serious influence in retarding the output of cars from the French factories. If exception is made of Delage and Voisin, practically no firm in France is producing new passenger cars, and very few will be in a position to produce in less than six months.

Citroen, who promised an output of 100 cars a day from the month of May, has fallen down on his program. All sorts of wild stories have been circulated as the alleged reason for this. At the present moment the entire works are closed, only the office staff and the engineers remaining at their posts.

The Citroen company states that it has been delayed by reason of difficulties in getting supplies, and particularly by reason of the shortage of malleable castings. All these difficulties have been overcome, and the factory is so far ready to go into production that if the strike was to end to-day, it would be possible to turn out 50 cars a day within one month and 100 per day within two months.

Immediately after the armistice Citroen announced a definite program and made definite promises of delivery, whereas other manufacturers had to admit that they did not know what they were going to do, or when they would produce. The result was that there was a real scramble to place orders with Citroen.

Now that he has failed to make deliveries on time, the people who were the first to get in their orders are generally the loudest in their denunciation or the most extravagant inventors of stories regarding Citroen's failure to produce according to schedule.

Amazing Prices for Cars

The fact that the French automobile factories are producing nothing for immediate delivery, together with the practically total prohibition of imports, has had its influence in boosting used car prices beyond all recognition. Almost invariably an early 1914 car can be sold from 50 to 100 per cent more than it cost when new.

The French Y. M. C. A. is selling used Ford cars at $1,600. A big batch of Fords, having been through the

war, and in only moderately good condition, are being sold at $900 each to purchasers taking quantities. The French Government is selling new Fords at $1,200, but there is no guarantee, and the purchaser must go to Bordeaux to take delivery.

As an ordinary example of car prices, a 1913 10-hp. four-seater Panhard, which was bought in 1916 for $2,400, was sold to-day for $3,600. The car has never been painted since it left the factory, its engine has never been taken down, and one of the frame members has been broken and has had to be repaired by acetylene welding. This is not an exceptional case, but is merely given as an example of the prices prevailing in France.

Car prices are higher now than they were at any period of the war, or indeed at any period in the history of France. The situation is relieved slightly by the sales of army automobiles and trucks being made at different points all over France.

The French Government is organizing these sales of either repaired or wrecked vehicles. Most of the vehicles go to dealers and repair men, who put them into condition and find ready buyers. Very much of the material now being sold is in poor condition and cannot be put into service until extensive repairs have been carried out. These army sales relieve the truck situation a little, but do not bring much relief to would-be purchasers of touring cars.

One very unsatisfactory feature of this situation is that there are thousands of persons who had their cars requisitioned at very normal prices in 1914 and 1915, and who now would have to pay from 60 to 80 per cent more to regain possession of their own machines.

No American Cars Sold

Not a single American army truck or touring car has been sold in France. Reports are circulating that thousands of American cars are rotting in France, and that practically new Cadillacs can be bought for a few hundred dollars. This latter statement is false, except that a few were sold dishonestly by an officer, who has been convicted.

There are two or three groups of keen French business men watching the American army automobiles very closely and ready to purchase the entire lot as soon as they are released.

Personally I have met scores of men who have been told that somebody else had bought an army Cadillac, but I have not been able to find a single man who had made a purchase, or who could give me the name of a man who had succeeded in getting possession of any American army car, except those bought wrongfully.

It is understood that the French Government will arrange for the disposal of all American army automobiles now in France. In view of this the Motor Transport Corps is preparing trucks for sale, but nothing else has been done. There are several hundreds of trucks at Romorantin; there are several thousands at Bourges; there are a few thousands at St. Nazaire, many of these being new; there are immense quantities of automobile material at Verneuil, near Nevers. But nothing is being put on the market.

(Completion of this sale arrangement was told of in a cable from Bradley printed in AUTOMOTIVE INDUSTRIES, July 3.)

In some cases the Liquidation Board has made sales to the Polish, the Serbian and the Roumanian Governments. The French Government has taken over a small number of American army trucks to be used by the automobile service in the devastated regions. Offers from private persons are rejected daily.

The impression prevails that the French wish to sell, first, their own automobile material, beginning with the worst and working up to the best; later they will offer the American material for sale, trying to dispose of it as far as possible to foreign governments, and in any case preventing as little as possible of it getting into the hands of private owners. This is the impression gained after making inquiries in all quarters.

It has to be admitted, however, that it is hard to get definite information and harder still to find traces of a real policy. Officers on the Liquidation Commission, who really ought to know, admit that they have no idea what is going to happen, or when this matter will be cleared up.

Among dealers there is great annoyance at the lack of any definite policy regarding automobile imports. Rumors are plentiful and change every day. On Monday imports are going to be allowed on a 30 per cent basis; on Tuesday this has jumped to 75; by Wednesday it is total prohibition for one year; on the following day there is going to be a favorable decision within a week. The only certainty is that car prices rise every day. At the present time dealers do not care very much what import duty is adopted. The demand is so great, the market is in such an abnormal condition, that they could sell all the foreign cars for which delivery could be assured, no matter what the import duty.

Foreign dealers do protest, however, against the lack of decision. Whereas England has announced a definite policy on a 33 1/3 per cent basis, France has done nothing more than admit motorcycles which were represented on the French market before the war. Yet France has always exported more than ten times more automobiles than England.

There is a fear among French representatives of American and other foreign cars that a decision on the question of import duty will be deferred until after the automobile show. Not knowing on what terms they could import, it would be practically impossible for a foreign dealer to do business at the show. Already there is annoyance at the attempt to shut America out of the automobile show by giving her space only after everybody else has been served.

Transport Workers Strike

The strike of all transport workers in the city and district of Paris has caused immense annoyance to the general public. All the surface cars and the motor omnibuses within the city are controlled by the Compagnie Generale des Omnibus. Whilst all the workers are on strike, the company has been able to run a few of its buses with the help of volunteers, some of them being wealthy persons who have taken up this work with no other object than to assist the public. The subways are all stopped or running on a very reduced scale.

Innumerable jitney services have come into operation. These are being carried out by all kinds of old derelicts which normally ought to have been on the scrap heap years ago.

The strike has affected the gasoline supply. According to a Government statement there is no shortage of gasoline in the Paris district. The fact remains, however, that none can be bought either at the garages or at the refineries. A certain amount of benzol is on sale and is being made use of in place of gasoline. The taxicab services have remained in operation, but these vehicles never did run on anything but benzol. The average price of benzol outside the city limits is 93 cents a gallon. In a few cases profiteers charge double this price.

There is also a great shortage of pneumatic tires. All

the French tire factories are delivering greater numbers of pneumatics to the armies than during the most active period of the war. The consequence is that the factories or their accredited dealers cannot supply direct to the public. Tires can be obtained, however, by going to outlaw dealers, who charge a considerable increase over the normal price list.

It is somewhat of a mystery where these tires come from. If the army is buying all the available stocks, it would appear that the tires offered by the outlaw dealers are stolen army goods. The Government declares that there are no leakages, and at the same time the police court reports contain accounts of trials of men convicted of having stolen thousands of dollars' worth of army automobile material.

The Motor Transport Corps mechanics stationed at the St. Nazaire reception park organized races on the beach on Memorial Day. All the cars taking part in these races were assembled from the salvage heap. In no case did the racers represent less than four makes of cars. There were Packard engines in Ford chassis. There were cars made up of a Pierce-Arrow engine, a Cadillac frame, a Winton front axle, and a Peerless rear end. The co-operation was so great that nobody could claim to have built the winning machine, nor was the exact composition of the winner announced.

It is reported that the headquarters of the Motor Transport Corps, which has been stationed in the town of Tours during the war, will be removed to Paris during the month of July.

How to Get the Most Out of the Business Paper

HOW do you handle the trade and technical papers? Does the information contained in their pages become a permanent part of your reservoir of information? If not, you are not getting the highest value from what can be made the most valuable source of information in your office.

No text book can give you the information which is contained in the trade periodicals. Textbooks have their place in giving the fundamental information and facts that are basic and almost entirely empirical in their nature if dealing with questions of design. In the sales end of the business, books on salesmanship while of the highest value cannot be up-to-date on new methods. To keep informed of trends in design, of new methods in merchandising, factory management or any of the hundred-and-one specialized subjects, it is necessary that you read faithfully a carefully selected list of business papers.

If you are the head of a department, it should be made a matter of duty on your part to see that the men under your charge read regularly the papers which specialize extensively on the line of work that they are doing. It is only possible to accomplish this by going at it systematically, and this is already being done in a large number of progressive plants.

The method adopted, for instance, by some of the larger concerns, is to paste a note slip on the cover of the magazine, as soon as it reaches the plant. This slip instructs the men to read and check the important items, stating that the magazine will be in charge of each man in the department for one day. It is the duty of the librarian to see that this plan is carried out. At the bottom of the slip is a list of names of the men in the department to whom the paper is intended to go.

Opposite the names of the men are two columns. The first is headed, Page No.; the second, Wanted Again. As the man reads the article, he checks in the first column. If he wants to re-read or study an item, he checks the Wanted Again column.

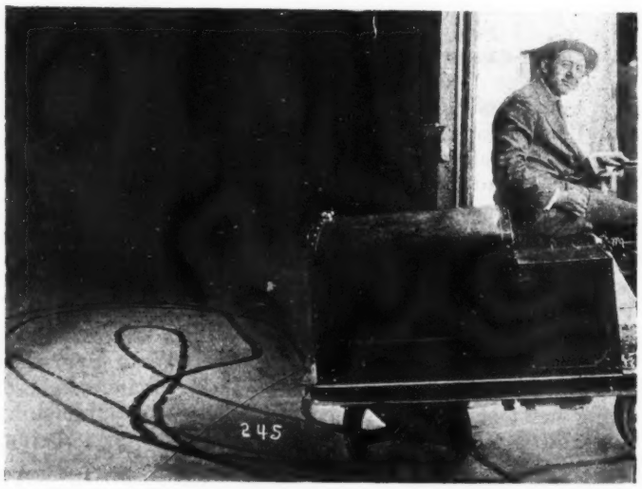
When the paper has worked its way through the list of names, it goes back to the library and card index note is made of articles, name of paper, date and page. Thus, these articles which the men in the department have decided may at some future time be of value have become a part of the permanent reference library of the department.

Contrast this with the usual method of procedure where the department head receives the paper. Perhaps he reads it, perhaps he delays doing so until the next issue arrives, and then he neglects it altogether, although it may contain information worth thousands of dollars to him or the company for which he is working. After reading it and perhaps gaining information of great value, does he file it away logically so that he can find it again? No, it is thrown into a pile, perhaps, and he trusts to his memory to either retain the information or to remember where and when he saw the article that contained it. He can do this for two weeks if he has a good memory and after that his mind has reached the stage, where, if the subject comes up in conversation he is able to say, "Oh, yes, I saw something on that somewhere, I think, about a year or two ago."

Systematize the reading of the business paper in your department. It is easy to arrange a method to suit the peculiarities of your line of work. Why throw away a storehouse of specialized information when a little thought will make it a valuable asset in your business?

NOTE THE TURNING RADIUS

Now we have the 1919 model of industrial trucks. In this debutante the short turning radius is featured. The photo was made in a freight car. The power plant is in unit with the drive gears, enabling the whole to be re-



moved without disturbing the alignment. The frame of the tractor is carried on semi-elliptic springs. Motor car practice is noticeable in the design of the unit. The drive gears are of the reversible worm type, driving through a four-pinion differential. Ironclad Exide batteries are used. It is the newest model of the Mercury Mfg. Co.

Prepare for Labor Unrest While Labor Is Content

There is a lesson for American employees in the happenings of the older countries under the stress of war reconstruction. In this article, Mr. Tipper points out that even during prosperity and industrial peace and contentment the radicals never let their printing presses or their propaganda machine remain idle. They prepare the seed bed during the idle season. This is the lesson for the American employer.

By Harry Tipper

ONE of the difficulties in attempting a true analysis of industrial conditions, with particular reference to labor in the various countries of the Western civilization to-day, arises from the fact that practically all information is colored by the character of the source or by the habit of mind of those who communicate it.

Traditional prejudices, traditional methods of thought, political necessities, organization propaganda and the desire for sensationalism enter into the statements which are issued in respect of labor conditions and make it impossible for the average man to arrive at a true conception of the industrial and political situation in the various countries concerned. Some general statements can be made which are of great importance to any manufacturer and which emphasize the necessity for a more careful study of the problem and its relation to political life.

Although the information which comes from official sources in Great Britain and France and other allied countries, indicates the beginning of reconstruction activity and the development of readjustment, it is evident that the strain of war has left these countries with a weakened respect for governmental and social system, as it is at present constituted, and less of the dislike for experimental changes.

Reading between the lines of the official cables and information sent from the regular news sources and piecing these out with the views of correspondents of different sympathies, a general agreement is found through the statement that radical ideas are growing in these countries and not only radical ideas but the demand for radical and immediate action is also growing.

For the first time in the history of the Western civilization the power of the industrial workers and the effect of that power was visibly felt and seen during the war, for the first time the workers in the allied countries know the power which they possess and realize, perhaps overemphasize, the importance of that power in the economic and political life of the nation. They have been loosed from their habitual moorings during the same period of time under the strain of new and difficult conditions and are not so averse to experimental changes as they were when the war forced such changes upon them.

The difficulties and delays accompanying the signing of peace, the lack of leadership in reconstruction measures, the length of time required for demobilization and the timidity of government, have produced a feeling of bewilderment and confusion among the people which has had its part in inducing a demand for action of some kind.

When the general body of opinion in the nation begins to demand action of some kind, the stability of the government is seriously threatened because any kind of action seems desirable and the necessity for action becomes more important than the wisdom or the character of the action itself.

We complain in this country of the high cost of living, but the situation in the allied countries of Europe is very much worse. Unemployment is a very serious problem.

The labor unions and the political labor organizations find themselves unable to solve the difficulties. Where they have been taken into the government councils they have failed to produce any adequate results and where they have been called upon to act by the members of their unions they have succeeded in making matters worse by attempting to cure the disease by artificial aggravation. The only cure for the unemployment problem in Europe is the development of a maximum productive capacity as rapidly as possible.

Nevertheless, the labor unions are slowing down on their production on the false assumption that this will create more work for the unemployed. Prices tend to become higher and articles of commerce to become scarcer, the subsidies created by the government during the war in the attempt to reduce or keep down the cost of living are being maintained because none of the politicians have the courage to withdraw them.

In this country conditions are so much better that they are comparable in only one sense. Unemployment is almost negligible at this time. The approaching crop season finds us with a scarcity of farm labor and in several industries there is also a scarcity of the right kind of trained help. The outlook for prosperity in industry is good, the demand for the products of the United States is greater than it has been in normal times and its position in the world's markets is almost unassailable. Habits of life in this country, during the war, were not sufficiently changed to operate after its finish to any great extent.

The reasons for the unrest in Europe do not apply to this country and the unrest in this country is neither so serious nor so important. It is true, however, that radical opinion is growing even here, and growing quite rapidly in comparison with the pre-war period. The point of view of the worker is different and he is beginning to demand changes with a different accent upon the

demands and with a suggestion of threat in the demands that is a new thing in American industry.

Not long ago a manufacturer from one of the large cities told me in the utmost perplexity, of the years before the war when he had known every employee in his factory and known all about them and had a comfortable family existence with them and had felt that his organization was built along stable and human lines.

"They used to stay with me," he said, "and I knew their history, their difficulties, their family affairs, and was interested in their social life. That is all changed. They appear to have lost all their interest. I am entirely unsuccessful in regaining it."

This attitude is observed in all parts of the country. It is noted among domestic workers and noted among the most highly skilled labor. The growth of radical opinion and this tendency of a large body of people to disregard the conventional forms of organization, suggest that the present government system has lost some of its value, or is losing some value in the eyes of a considerable body of voters and a change is looked upon with equanimity, where it is not suggested with enthusiasm.

It is not without its significance that the organization of the Industrial Workers of the World, and the twenty or thirty similar organizations who are interested in the promulgation of the same political creed, have grown very considerably in the last two or three years and have secured a larger proportion of recruits from the middle class than ever before. These changes in the United States are of importance, because they indicate the necessity for action within a reasonable time, which will preserve the orderly form of organization and give the worker a broader outlook and partnership in the industrial development.

They indicate, moreover, that the old rules of measurement of public opinion must be discarded and new rules must be set up, if the value of the system is to be preserved and progress adapted to it. The years of prosperity which are before the United States offer an opportunity for the development of industrial organization changes, which are calculated to lay the foundation for our orderly progress, provided that the manufacturer is ready to use this prosperous period for the purpose of instituting and solidifying such changes.

It is not merely that the worker should be given some voice through joint councils or similar systems, or that he should be given a more adequate share in the results of his labor through profit sharing, but it is that the worker should be given an opportunity and a thorough basis for believing that the owners of industry (Capital so-called) are desirous of dealing squarely with the matter. By this means suspicion can be removed during this period.

In these articles, the suspicion which exists on the part of the worker regarding all movements by the owners of industry has been emphasized from time to time, but the statements of manufacturers and the propaganda which has accompanied suggested changes in their organization, indicate that this is not fully understood by most manufacturers and is not understood at all by many of them.

The manufacturer cannot make an advance to the worker which will be received without suspicion, and that suspicion is likely to occur and recur from time to time until the changes have been operating for so long that these repeated suspicions have proved to be entirely groundless.

Where industrial suspicion and unsatisfactory social conditions produce a state of general unrest, there is no opportunity to quiet this suspicion. The action of the British government in regard to the Sankey Commission Report, the calling of the National Council, the attempts at arranging matters for the railroad, and similar conferences which have occurred in Great Britain have left the workers with a criticism of the government position, with a deep suspicion that they are favoring the invested interests and with practical disbelief in the justice of their motives.

The utterances of labor leaders show that the worker is not at all satisfied that the intentions of the government and the manufacturers' associations are just and honorable, although they have gone much further in that country than we are prepared to go in the United States.

The trouble is that there is much unrest of a general character in Great Britain, so much unemployment and so much difficulty with the social surroundings that there is neither the time nor patience to satisfy bitter opponents, that there is justice on both sides and common possibility of agreement.

No one knows how far the situation will go before this confidence is established, but it is not yet visible and for that reason all the attempts at conciliation and agreement have failed up to the present.

The years of prosperity, to which we are looking forward in the United States, will prevent social conditions from becoming acute and too burdensome on the individual worker. It will insure a continuance of employment for most workers and an active industrial organization, so that the physical surroundings and the mental conditions will be favorable to the development of confidence between employers and employees and the gradual establishing of a feeling of community of interest to replace the present suspicion.

Many manufacturers, however, are inclined to regard the prosperity which lies before us as a convenient reason for again neglecting the labor question and the study of all human relation. Time after time manufacturers have expressed this view to the writer when they have stated that normal peace operations will iron out all the trouble. The history of the last hundred years will show that this is a fallacy.

Prosperity has removed the difficulty from visibility for a time but the next swing of the pendulum has shown the increased bitterness which comes from a delayed solution. Every succeeding wave of unrest for a number of years in Great Britain has increased the solidity and definition of the workers' demands, their organized power and the imperiousness of their statements.

The prosperity which we are facing is not an excuse for delay in dealing with the problem. It is an opportunity for success in laying the foundation of its solution by establishing a basis of confidence. This can be established, only, when the causes of unrest are not so acute and the material surroundings are comfortable. In all of the utterances of the periodicals there is an attempt to minimize labor troubles which arise and to suggest that they are not very important. That is true of practically all the public press except the radical organs, the work of which is being carried on continuously and without any diminution.

From a conservative estimate there are in New York 40,000 active workers engaged in promulgating radical economic theories of government similar to those held by the I. W. W. and the Bolshevists. Printing presses for radical propaganda are just as busy as those of any other kind, and they preach with more consistency, dinning it into the ears of the people constantly and without ceasing.

In talking with a leader of the Bolshevists the other day, the writer mentioned the probable prosperity in the

United States in the next decade as something which would make it difficult for the Bolshevists' doctrines to make any headway. The answer of the Bolshevist was very interesting. He said:

> **"If the manufacturers and politicians will continue to sleep during that period of prosperity they will be more effective for our cause than all the propaganda which we can issue."**

A correspondent in Great Britain, who has unusual opportunities of observation, as the head of a large business, and who is trained in political and international affairs, states as the main trouble in Great Britain, the lack of active leadership and the general policy to drift in the hope that something will remove the necessity for action.

In this country we have active leadership enough in industry to supply evidence of practical experiments in organization that offer some hope. These practical experiments can only become of value when they are multiplied a thousand times so that they are impressed upon the public and represent the proportions of a general movement having a corresponding effect upon public opinion. They must be undertaken by the manufacturer. The politician who spends his time, like the inefficient parent, in distributing the favors to those who scream the loudest, will be of no help in this matter but will stand aside until the direction of the current is obvious and its strength is undoubted.

From the professors, the publicists and the preachers, the manufacturer can expect little sympathy because they have not understood his position and they know the history of industry's past mistakes. The great middle class in this country will be in favor of orderly progress, but they will not and cannot initiate any movement; while the farmers have joined with other organizations only when they have operated in conjunction with the labor unions at different times.

The manufacturer has had already an indication of the difficulties to be encountered when the governmental experimentalist tries his hand at the adjustment of social and industrial conditions. If he has not learned the absurdity of collective action by government in this respect during the war, the most important indication of that period has passed him by.

Government will continue to experiment with industrial economics and there is no doubt that most of the political questions of the next decade will affect industry more intimately than they have in the past. Almost all political platforms make many references to industrial regulations and treatment, and practically all so-called political reform platforms are purely economic in character and relate almost entirely to industrial reorganization.

> **The development of the situation is in the manufacturers' hands. He can meet it by intelligent study of the necessities, by courageous and conservative experiment and by patient operations in establishing confidence with his own employees. Or he can let the matter drift in the hope that some miracle will defer the difficulty until after he himself has passed away.**

The European civilization shows a more unstable condition of government than at any time since the French Revolution, and while the outlook in this country is not similar, the lack of leadership in government, the confusion of opinion and the growth of radical propaganda cannot be neglected. Labor demands will continue to be excessive and the radical political parties will continue to exploit unrest by the formation of strikes for frivolous reasons. Manufacturers' motives will continue to be suspected, but if the leaders of industry use the opportunity right, the next decade in the United States can provide the world with an example of orderly progress in political industrial relations.

Story of the R-34 Transocean Flight

(*Continued from page* 58)

ful pink glow on the white clouds in every direction. Course steered, 320 deg.; course made good, 299 deg. Air speed, 44 knots; speed made good, 55 miles per hour.

All through the first night in the Atlantic the ordinary airship routine of navigating, steering and elevating, also maintaining the engines in smooth running order, goes, watch and watch, as in the daytime.

The night is very dark. The airship, however, is lighted throughout, a much enlarged lighting system having been fitted. All instruments can be individually illuminated as required, and in case of failure of the lighting system all figures and indicators are radiumized.

The radium paint used is so luminous that in most cases the lighting installation is unnecessary.

8.20 a. m.—Thursday, July 3.—The clock has been put back another hour to correct our time to Greenwich mean time. Position: Longitude 35 deg. 60 min. west; latitude 53 deg. north.

Cooke got position by observation on sun and a good cloud horizon and considers it accurate to within 30 or 40 miles.

Our position is over the westbound steamship route from Cape Race to the Clyde and momentarily crossing the eastbound route from Belle Isle to Plymouth.

We are well over halfway between Ireland and Newfoundland and are back again on the Great Circle route, having been slightly to the south of it owing to the drift effect of a northerly wind.

Good weather report from St. John's.

12.45 p. m.—Durrant is speaking S. S. Canada on our spark wireless set, so there may be a chance of our seeing her shortly, as the sea is temporarily visible. The second wireless operator obtains his direction on our directional wireless, so that we may know in what direction to look for her. All we know at the moment is that she is somewhere within 120 miles.

Captain David, in command, wishes us a safe voyage. We gaze through our glasses in her direction, but she is just over the horizon.

2 p. m.—Slight trouble with starboard amidships engine; cracked cylinder water jacket. Shotter, always equal to the occasion, made a quick and safe repair with a piece of copper sheeting, and the entire supply of the ship's chewing gum had to be chewed by himself and two engineers before being applied.

4.30 p. m.—We are now on the Canadian summer route of steamers bound for the St. Lawrence, via Belle Isle Strait and over the well-known Labrador current. There are already indications of these cold currents in the fog which hangs immediately above the surface of the water.

Scott and Cooke spend much time at chart table with protractors, dividers, stop watches and many navigational textbooks, measuring angles of drift and calculating course made good.

Aerial navigation is more complicated than navigation on the surface of the sea, but there is no reason why, when we know more about the air and its peculiarities, it should not be made just as accurate.

5 p. m.—Harris unwisely shuts his hand in door of wireless cabin; painful but not serious. Flow of language not audible to me, as the forward engine happened to be running.

6 to 7 p. m.—We are gradually getting farther and farther into the shallow depression which was reported yesterday coming up from the South Atlantic. For the last four hours the sea has been rising, and now the wind is south-southeast, forty-five miles per hour. Visibility only half a mile. Very rough sea and torrents of rain. In spite of this the ship is remarkably steady.

At 8 p. m. Scott decides to climb right through it, and we eventually came out over the top of it at 3400 ft.

Brilliant Cloud Picture

8.30 p. m.—We have now passed the center of the depression, exactly as Harris foretold. The rain has ceased, and we are traveling quite smoothly again.

To the west the clouds have lifted and we see extraordinarily interesting sky—black, angry clouds giving place to clouds of a gray mouse color, then a bright salmon pink clear sky, changing lower down the horizon to darker clouds with a rich golden lining as the sun sinks below the surface. The sea is not visible, and is covered by a fluffy gray featherbed of clouds, slightly undulating, and extending as far as the eye can reach. The moon is just breaking through the black clouds immediately above it.

On the east we see the black ominous depression from which we have just emerged, while away more to the south the cloudbed over which we are passing seems to end suddenly and merge into the horizon.

We are getting some valuable meteorological data on this flight without a doubt, and each fresh phenomenon as it appears is instantly explained by the ever alert Harris, who has a profound knowledge of his subject.

9 p. m.—One of the engineers has reported sick. Complains of feverishness.

A stowaway has just been discovered, a cat smuggled on board by one of the crew for luck. It is a very remarkable fact that nearly every member of the crew has a mascot of some description, from the engineer officer, who wears one of his wife's silk stockings as a muffler around his neck, to Major Scott, the captain, with a small gold charm called "Thumbs Up."

We have two carrier pigeons on board, which it has been decided not to use. Anyway, whether we release them or not, they can claim to be the first two pigeons to fly the Atlantic.

4.30 a. m.—Friday, July 4.—Wonderful sunrise, the different colors being the softest imaginable, just like a wash drawing.

7 a. m.—Height, 1000 ft. Bright blue sky above, thin fog partly obscuring the sea beneath us; sea moderate; big swell.

The fog bank appears to end abruptly ten miles or so away toward the south, where the sea appears to be clear of fog, and a very deep blue.

Standing out conspicuously in this blue patch of sea we see an enormous white iceberg. The sun is shining brightly on its steep sides, and we estimate it as roughly 360 yd. square and 150 ft. high. As these icebergs usually draw about six times as much water as their height, we wondered whether she was aground, as the depth of water at that point is only about 150 fathoms.

Another big iceberg can just be seen in the dim distance. These are the only two objects of any kind, sort or description we have as yet seen on this journey.

8.15 a. m.—Fog still clinging to the surface of the water; water evidently must be very cold. Extraordinary crimpy, wavelike appearance of clouds rolling up from the north underneath it. Harris has never seen this before. Pritchard took photographs.

On port beam there is a long stretch of clear blue sea sandwiched in between wide expanses of fog on either side, looking just like a blue river flowing between two wide, snow-covered banks. Cause, a warm current of water which prevents cloud from hanging over it. This well illustrated the rule that over cold currents of water the clouds will cling to the surface.

9 a. m.—We are now over a large icefield, and the sea is full of enormous pieces of ice—small bergs in themselves. The ice is blue-green under water, with frozen snow on top.

A message reaches us from the Governor of Newfoundland:

To General Maitland, Officers and Crew, R-34:

On behalf of Newfoundland I greet you as you pass us on your enterprising journey.

HARRIS, Governor.

Replied as follows:

To Governor Newfoundland:

Major Scott, officers and crew R-34 send grateful thanks for kind message, with which I beg to associate myself.

GENERAL MAITLAND.

Land in sight. First spotted by Scott on starboard beam. A few small, rocky islands, visible for a minute or two through the clouds, and instantly swallowed up again.

Altered course southwest to have a closer look at them. Eventually made them out to be the northwest coast line of Trinity Bay, Newfoundland.

Our time from Rathlin Island—the last piece of land we crossed above the north coast of Ireland—to north coast of Trinity Bay, Newfoundland, is exactly 59 hours.

See Newfoundland

2.30 p. m.—We are crossing Newfoundland at 1500 ft., in thick fog, which gradually clears as we get farther inland. A very rocky country, with large forests and lakes, and for the most part no traces of habitation anywhere.

Message from St. John's to say that Raynham was up in his machine to greet us. We replied, giving our position.

3 p. m.—Again enveloped in dense fog. Message from H. M. S. Sentinel giving us our position. We are making good 38 to 40 knots and heading for Fortune Harbor.

We have passed out of Fortune Harbor, with its magnificent scenery and azure blue sea dotted with little white sailing ships, and are now over the two French islands, Miquelon and St. Pierre, and steering a course off Halifax, Nova Scotia. The French flag was flying at St. Pierre, and was duly dipped as we passed over.

7.45 p. m.—Passed over tramp steamer S. S. Seal, bound for Sydney, Nova Scotia, from St. John's, the first we have seen.

8.15 p. m.—Clear weather. Sea moderate. Making good 30 miles per hour on three engines. Northern point of Cape Breton Island, Nova Scotia, just coming

into sight. Lighthouse, four flashes. We should make Halifax 2.30 a. m. to-morrow.

Saturday, July 5, 2.30 a. m.—Very dark, clear night. Lights of Whitehaven show up brightly on our starboard beam, and we make out the lights of a steamer passing us to the east. Strong head wind against us. Making no appreciable headway.

Scott decided to turn inland to avoid southwest wind barrage flowing up the coast. Crossed coast at Goose Island, Country Harbor.

Miles and miles of endless forests. Here and there a clearing with a hut or two, a few cows, and an acre or so of cultivated land. Any number of small rivers and lakes.

10.20 a. m.—We are down as low as 800 ft. over huge forests. Lovely resinous smell of pines, which we inhale with delight. Stacked tree trunks look like bunches of asparagus from above.

Put the "wind up" a big brown eagle.

We all agree we must come to Nova Scotia for shooting and fishing.

12.30 p. m.—Lunch.

Gasoline Worry

The petrol question has become distinctly serious. Shotter has been totaling up our available petrol resources with anxious care. We have 500 miles to go to New York, and if we don't get any wind or bad weather against us will do it all right with two engines, assisted occasionally by a third engine. We cannot afford to run all five at once owing to the petrol consumption.

Lieutenant Commander Lansdowne, United States Naval Airship Service, sends signal on behalf of R-34 to United States authorities at Washington and Boston to send destroyer to take us in tow in case we should run out of petrol during the night.

The idea is we would then be towed by the destroyer during the hours of darkness, and at dawn cast off and fly to Long Island under our own power. Let us hope this won't be necessary.

It is now raining and foggy, which is the kind of weather that suits us now, as rain generally means no wind.

3 p. m.—Passed Haute Island in Fundy Bay.

3.30 p. m.—For some little while past there had been distinct evidences of electrical disturbances. Atmospherics became very bad, and a severe thunderstorm was seen over Canadian coast, moving south down the coast.

Scott turned east off his course to dodge the storm, putting on all engines. In this, fortunately for us, he was successful, and we passed through the outer edge of it. We had a very bad time, indeed, and it is quite the worst experience from a weather point of view that any of us have yet experienced in the air.

During the storm some wonderful specimens of *cumulo mammatus* were seen and photographed. These clouds always indicate a very highly perturbed state of atmosphere, and look rather like a bunch of grapes. The clouds drooped into small festoons.

7.30 p. m.—We are now in clear weather again, and have left Nova Scotia well behind us and are heading straight for New York.

Particularly fine electrical disturbance type of sunset.

9.30 p. m.—Another thunderstorm. Again we have to change our course to avoid it, and as every gallon of petrol is worth its weight in gold, it almost breaks our hearts to have to lengthen the distance to get clear of these storms.

Sight American Soil

July 6, Sunday, 4 a. m.—Sighted American soil at Chatham.

4.25 a. m.—South end of Mahoney Island. Scott is wondering whether petrol will allow him to go to New York, or whether it would not be more prudent to land at Montauk.

5.30 a. m.—Passing over Martha's Vineyard; a lovely island, and beautifully wooded. Scott decided he could just get through to our landing field at Hazlehurst Field, but that there would not be enough petrol to fly over New York. Very sad, but no alternative. We will fly over New York on start of our return journey on Tuesday night, weather and circumstances permitting.

Landed 1.54 p. m. Greenwich mean time, or 9.54 a. m., U. S. A. summer time, at Hazlehurst Field, Long Island. Total time on entire voyage, 108 hr. 12 min.

A Technical Study of the R-34 Motor Plant

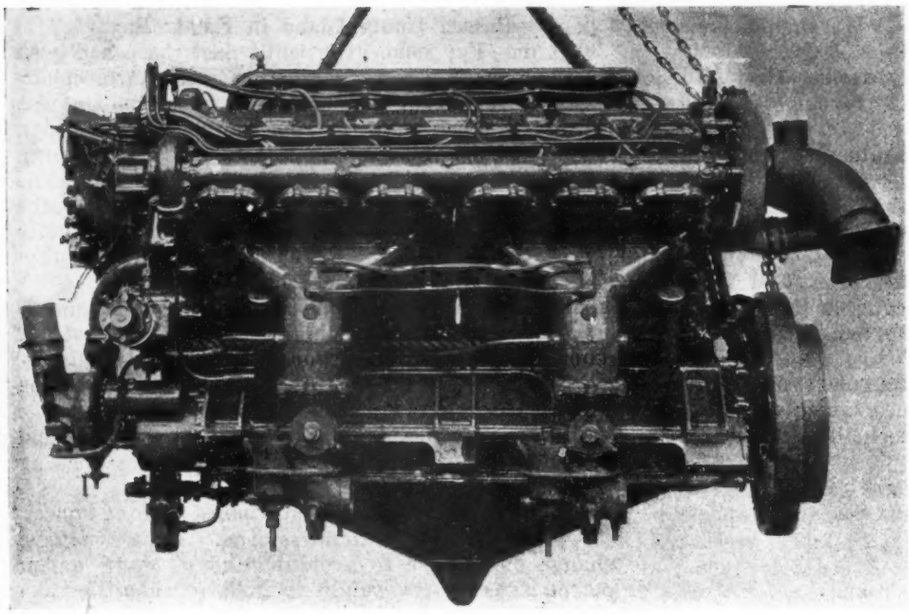
THE R-34 is a dirigible of the rigid class of which the Zeppelin is the prototype. It is 680 ft. long and has a diameter of 79 ft. The frame-work is of duralumin, an aluminum alloy, which is covered by doped fabric. Within the hull there are 19 gas bags to hold the hydrogen gas which gives the ship its buoyancy. The total capacity of the ship for hydrogen is in the neighborhood of 2,000,000 cu. ft., and as each 1000 cu. ft. of hydrogen lifts about 60 lb. the gross lift is 60 tons. Of this about one-half or 30 tons is taken up by the weight of the ship itself, while the remaining 30 tons are available for fuel, ballast, crew and provisions.

The ship is of approximate stream line shape, having a rather blunt nose, and a very pointed tail end. Four gondolas are suspended from the hull, one in front, known as the control car, two at the sides, known as the wing cars, and one at the rear, known as the aft car. Of these, the rear car carries two engines, both working on the same propeller, while each of the other cars carries one engine. All of the five engines are of the Sunbeam 12 cylinder Maori type. These engines have cylinders of 3.94 in. bore by 5.31 in. stroke, which are arranged in two sets at an angle of 60 deg. A compression ratio of 5.6 is used, and the firing order is 1-5-3-6-2-4. The engine develops its maximum horsepower of 280 at 2200 r.p.m., and its normal horsepower of 265 at 2100 r.p.m. The mean effective pressure at full engine power figures out to 125 lb. per sq. in.

There are two inlet valves having a lift of 0.3543 in., and two exhaust valves with a lift of 0.35 in. Each valve is fitted with two concentric coiled springs.

Four Claudel-Hobson carburetors of the 22 millimeter size are fitted, each supplying three cylinders. Each engine has two B.T.H. (British Thomson-Houston) magnetos which are geared to run at 1½ times crankshaft speed.

The engines are fitted with governors to hold their speed down to 2000 r.p.m. Exhaust manifolds are water cooled. Lubrication is by the pressure system, and an automatic arrangement is provided whereby the engine is shut down if the pressure on the oil drops below 35 lb. per sq. in. A double section gear type oil pump is



At the left is a side view of the "Maori 4," direct drive, Sunbeam-Coatalen engine used in the R-34. Below—An end view of the engine

used, one section of the pump delivering oil to the crankshaft bearings, and the other to the camshaft bearings. In addition to the oil feed pump there are two exhaust pumps, one exhausting the oil accumulating in the camshaft housings, and the other exhausting the oil from the sump. Both of these pumps have a common outlet to the oil cooling tank. While oil is fed to the bearings at a pressure of 35 lb. per sq. in., the pumps are capable of delivering a pressure up to 170 lb. Electric starters are fitted to all of the engines, and thus storage batteries have to be carried on board.

The connecting rod ends are very thin, and only 2 millimeters of white metal is used, which is cast into the big ends. The big end bushing is grooved circumferentially and longitudinally for distributing the oil over its entire surface. At the upper end of the connecting rod a bronze bushing is fitted, and the rod is open at the top, to provide for splash lubrication of this bearing, and also to hold the pin centrally in the piston.

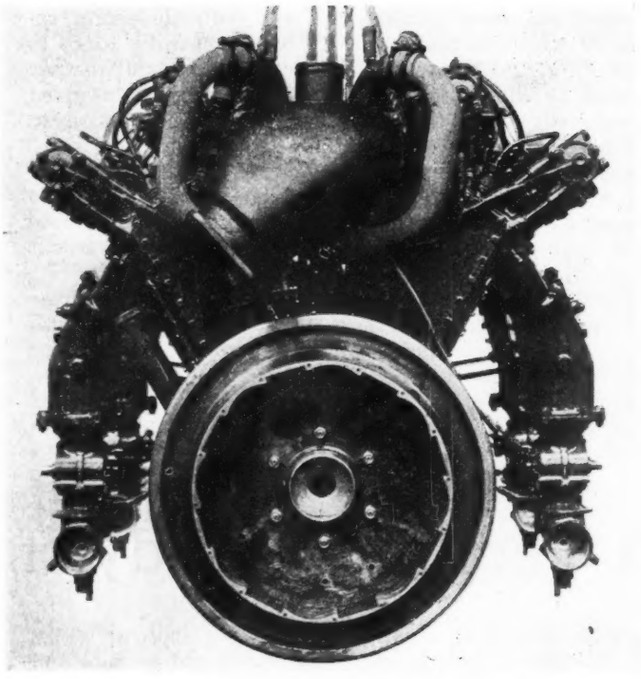
The Pistons

The pistons are aluminum die castings, with three compression rings at the top and one scraper ring at the bottom. The piston pin is fastened in the piston bosses and has its bearing in the top end of the connecting rod.

The cylinders are an aluminum block, which is fitted with steel liners. These liners are turned to 0.010 inch oversize. The cylinder block is then heated and the liner is dropped in cold. This operation, of course, must be performed very quickly in order to be successful. The face of the crankcase to which the cylinders are bolted is bedded by hand, and no gaskets are used. The workman uses two test gages, one to insure that the faces are at 60 deg. and the other a flat gage with an arm extending to the crankshaft so as to insure the proper distance of the cylinder mounting surface from the crankshaft axis.

The overall dimensions of the engine are as follows: Length, 55.11 in.; width, 35.46 in.; height, 33.85 in. The weight of the engine dry is 890 lb., giving a weight efficiency of 3.3 lb. per horsepower. In running order, but without fuel, oil and tanks, the engine weighs 1065 lb., making 3.95 lb. per horsepower.

The engines are geared down in the ratio of 4:1, and are provided with a friction clutch of the Hele-Shaw type. In addition to the friction clutch, there is also a



dog clutch, which permits of running the engine free without putting pressure on the clutch springs. All of the propellers are pusher propellers. During the trip it was very seldom that all five of the engines were operating together. With only two engines, the airship can make a speed of 30 knots per hour, and with four of the engines running a speed of 56 knots can be attained.

A total supply of 6000 Imp. gal. (20 tons) of gasoline was carried when the ship left Scotland, and of this about 4500 gal. was consumed during the trip. Ordinarily, under favorable weather conditions, the ship can cover a distance of one mile with a consumption of one gal. of gasoline, but it will be seen from the above figures that on the westward trip the consumption was substantially 1½ gal. per mile covered. While the distance between New York and Scotland is only 3100 miles, it is estimated that the air distance flown was about 3600 miles. The engines developed their highest

efficiency at 1600 r.p.m., at which speed, under full throttle, the fuel consumption is about 0.51 lb. per horsepower-hour. The fuel is stored in a series of tanks located in the bottom of the hull, which together with the ballast tanks form a stabilizing keel. Each tank has a capacity for about 500 lb. of fuel. In each gondola there is a small service tank fed from the main tanks in the hull. Eleven tons of ballast were carried on the westward trip, of which some was discharged en route and about 2 tons just before the landing.

At the beginning of the trip all of the 19 gas bags were filled with hydrogen gas to atmospheric pressure. During the day, as the sun heated the gas in the bags, it would expand and some of it would escape through the blow-off valves. In this way from 5 to 6 per cent of the hydrogen was lost each day. Toward evening, as the atmosphere became cooler, and the gas contracted, the ship naturally sought a lower level, and this was counteracted when found necessary, by discharging ballast. With the loss in fuel as the ship neared its destination it was necessary to allow gas to blow off and when the trip was completed nearly one-half the gas originally carried was lost.

Operation of Engines

There are a mess-room and sleeping quarters for the crew within the hull of the ship. Both of these are sufficient only for one-half of the crew, for at least one-half of the men are on duty at any time. An idea of the manner in which the engines were operated and controlled was obtained from Engineer Officer Shotter. Owing to the fact that the fuel consumption per mile covered is lowest at low speed, the ship was sometimes driven by two engines only, most of the time on three engines, and occasionally on four. One engineer was stationed in the control car, one in each of the wing cars, and two in the aft car. Directions for the control of the engines were given from the control car by the engineer officer by means of engine control indicators, which consist of a rotable disc with various instructions printed thereon, which can be operated from the control car by means of wires. While provision for handling the engines of the ship in this manner were made in the design of same, during the trip across the ocean it was the practice of Shotter to pass from one gondola to another, and observe the operation of the engines, and if he found any engine laboring he would give orders for shutting it down temporarily. Shotter said that the fuel consumption of each engine was at the rate of 12½ gal. (Imperial gal.) per hour.

While the altitude of flight is controlled chiefly by the amount of gas in the bags, and the amount of ballast carried, it can be controlled also by means of the elevators, which are capable of lifting from five to six tons. It will be seen from the illustrations herewith that the control surfaces of the airship are arranged very much on the same principle as those of an airplane, there being both horizontal and vertical rudders and corresponding stationary stabilizing planes. All control of the big ship is effected from the forward or control car, through the intermediary of control wires which lead through the hull. The rudder has a full helm of about 20 deg., and in order to swing it way over it is necessary to give the steering wheel between 2 and 3 complete turns. The wire cables of the steering gear, extending through the hull, pass over a 9 in. drum.

At various times the R-34 ran into a fog, but as far as Shotter could observe there was no difference in the running of the engines. A peculiar behavior of the engine was noticed, however, while sailing over the Bay of Fundy. The ship was passing through a thundershower at the time, and the atmosphere had a peculiar smell. It was noticed that the windside engine was running very irregularly, speeding up and slowing down periodically, or producing the effect generally known as hunting.

In landing with a ship of the R-34 type use is made of the elevator. Just before coming down some of the ballast is discharged, so as to make sure that the ship will have a sufficient amount of buoyancy; then the elevator is set so that as a result of the forward motion produced by the propellers, the ship will plane down, and when a sufficiently low altitude is reached the landing crew catch the guy wires and the engines are brought to a stop.

Most of the running during the trip was done on three engines. This was the condition of operation during the first 300 miles after leaving Scotland. At that point a head wind of about 15 to 16 knots velocity was run into, and an additional engine was started up.

The R-34 is substantially a duplicate of an earlier ship, the R-33, the two having been built especially to serve as air scouts for the British Navy. They were also intended for bombing purposes, and were provided with openings through which a load of bombs could be dropped, the bomb carrying capacity of the ship being four 800 lb. and sixteen 120 lb. bombs. On top of the hull emplacements for eight guns were provided. It was, moreover, the intention that on a bombing expedition the ship should be accompanied by a protective guard of about 100 airplanes. The ships were built at Inchinman near Glasgow.

Using Exhaust Heat

The gondolas of the ship are connected by a 600 ft. passage way inside the hull. This passageway or platform has a floor of plywood laid on a girder support. The crew secured its hot water from the engine radiators and meals were cooked by exhaust heat. While comfortable sleeping quarters were provided, some of the men did not get very much chance to rest. Engineer Officer Shotter, for instance, slept only 4 hours out of the 108 the ship was on her way, and this he had to snatch in half-hour doses, for usually no sooner had he fallen asleep than something happened that made it necessary to wake him up.

The engines, Shotter said, ran well all through the trip. It seemed to be his opinion, however, that a somewhat simpler and stauncher engine was more desirable for airship service. The officers seen by the AUTOMOTIVE INDUSTRIES staff were somewhat vague in regard to the reason for calling for help on Saturday morning. It appears, however, that as they were nearing depletion of their fuel supply and as the safety of the ship depended almost entirely upon the amount of fuel carried on board they were getting slightly nervous.

Major Scott, the commander of the ship, when asked his opinion as to the practicability of a regular airship line across the Atlantic, said that airship service should be tried out and developed on a less difficult route. In regard to the ship, he said that she was underpowered. What is needed is a ship of larger capacity which will permit of carrying a much larger fuel supply and permit of running the engines at more nearly full load. This would make the ship less dependent on wind and weather. As an example of the efforts made to reduce the air resistance, it may be mentioned that the radiators of the two rear engines are so arranged that they can be drawn into the gondola when the engines are not running and pushed out into the airstream when the engines are started up.

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The Automobile

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Science and Unions

A DELEGATE of the newly organized Federation of Federal Employees to the American Federation of Labor convention at Atlantic City has told of an interesting incident concerning the adoption of resolutions approving of the scientific research by Federal bureaus. The Federal employees had drafted their resolutions, which ask for better co-ordination of the several research bureaus, and presented them to the resolutions commitee of the A. F. of L., at Atlantic City. In the course of time the representatives of the Federal Federation were called.

"I never underwent a sharper cross-examination than in that committee room," said this delegate. "There were on that committee men who knew all about mining, mechanics who knew much about standardization work, and in fact, we thought they knew about everything we were doing in Washington before we got through answering their questions.

"These questions were practical, to the point and they brought out the very things we were most anxious to get before the committee. I had not expected quite such a reception. We thought that we would have to present our case, but when the committee got through with us, there was nothing left to present. The committeemen appeared to be much impressed by our endeavor to make the Federal rsearch practical."

This report indicates that the meeting was of benefit to both the older and the newer workers in the ranks of organized labor. Frankly, the unionized Federal employees did not expect a very hearty reception from the leaders in the labor movement. Apparently, the labor leaders expected the U. S. scientists to be a more or less visionary body. When they met, they found that each wanted to get down to intelligent, practical work. There was surprise on both sides and the Federal employees feel that they greatly advanced the cause of making the research bureaus practical and most helpful to industry.

Department Needs S. A. E.

HEREAFTER the closest co-operation must and will exist between the automotive industry as represented by the Society of Automotive Engineers, and the War Department. No one could have attended the army and navy session at Ottawa Beach, on the occasion of the summer meeting of the S. A. E., without being impressed as to the necessity for establishing the closest sort of relationship between the industry and the Government.

General C. C. Williams, Chief of Ordnance, as well as representatives from the Signal Corps, Motor Transport and other branches of the service were outspoken in expressing the need for the continued and active co-operation of the society with the department in the future preparedness of the country. The internal combustion engine proved to be such a vital factor in this war that every country in the world will push the development of automotive apparatus to the limit. Commercially we are supreme, and with the proper co-operation we can maintain military supremacy in this field.

Through the creation of a standing committee the sole duties of which will be to keep the War Department in line with the developments in the industry the S. A. E. will take an important step in the proper direction. By taking commissions in the Officers' Reserve Corps, engineers can also be of vital assistance and help the War Department to have at its disposal, in case of emergency, a trained personnel. Hundreds of engineers from this industry have become familiar with the problems to be met in the motor equipment sections of the various branches of the War Department work and all of these should stand ready to help in the kind of preparedness which the recent war has shown us to be a necessity.

As was pointed out at the meeting, the equipment of the motor transport corps, the tractor and gun moving equipment as well as the tanks developed in the Ordnance Department, will be obsolete five

years from now. Never again can such a wide separation of government and industry as existed before the war, be permitted. The problems of each are too closely intermingled. Those who can assist government progress to keep pace with industrial should put their shoulders to the wheel.

Trans-Atlantic Flight

THE successful flight of the R-34 must not be over-estimated as indicative of the immediate success of commercial aircraft over the ocean. Rather than impressing on us what it is already possible to accomplish with such a dirigible, its message to us is how little we have accomplished on this side to make trans-Atlantic service possible and how big is the task to be accomplished before commercial flying over the Atlantic can be started.

With the R-34, the biggest task has been handling it on the flat aviation field at Mineola, Long Island. Watching the big craft tug at her mooring and pull several hundred soldiers from side to side, tells in unmistakable words just how utterly unprepared we are for receiving this new colossus of inter-continental transportation. Crossing the ocean had its problems and its perils, but mooring the craft to the earth without the slightest facilities for the safe anchorage of such craft is but the opening sentence of a whole text book on what preparations must be made on both sides of the Atlantic and what undreamed of equipment must materialize before trans-ocean trips can be even considered from a commercial point of view.

It has been a tremendous risk to attempt to anchor the R-34 for three or four days on Long Island. The safety of the craft has been risked every five minutes of the time. Necessary hangars are needed for such craft, where they will be safe as the ocean steamboat when lashed to the Hudson river docks.

There is scarcely any equipment for overhauling the engines of the R-34 on the field yet, after covering over 3600 miles, there is real need for equipment specially designed for such work. The railroad locomotive goes to the roundhouse after every 150 miles but here is the R-34, traveling more than twenty times the distance and yet not a single aircraft roundhouse, or its equivalent, is at hand.

To give such craft as the R-34 the necessary housing and attention after a cross-Atlantic voyage, a miniature ctiy must be created around the landing field. Adequate gas containers for replenishing the gas bag, with up-to-date facilities for refilling are needed. Fuel tanks, with requisite filling facilities, are essential. There must be apparatus commensurate with the task for removing engines from the gondolas if complete repairs are to be made. Wood working shops for repairs must be at hand. In short, a most complete aircraft service depot, designed with modern dirigible craft in mind, must be built and equipped and manned before a single commercial trip of such aircraft should be made.

To-day there is not one iota of necessary equipment. There is just a flat open field, covered with grass with a few barracks along one side where the crew can get a few snatches of sleep. There must be accommodations for handling the craft and then comes the facilities for handling the passengers and the freight.

The layout of the grounds, the designing of the equipment for anchorage and housing are tasks jointly with that of making the craft equal to demands.

This experimental trip serves admirably to impress on an expectant public what it is necessary to do before commercial aviation across the Atlantic can be started. The R-34 is practicaly an experimental ship. She is practically out of date to-day. With dirigibles, it is much like with airplanes in the war, the development is so fast that a ship is obsolete before completed.

The R-34, although a monster 630 feet long and approximately 79 feet in diameter, is not one-half large enough, according to those in charge. Its 2,000,000 cubic feet of gas must be doubled. This will not double its length or diameter and will not outwardly greatly increase the size of the craft, but its lifting capacity will be doubled. Doubling the ship's capacity will double its usefulness and the crew will not have to be materially added to.

With present proportions the R-34, weighing about 30 tons and with a lifting capacity of 60 tons, too much of the lifting capacity is taken up with fuel needed for the trip to make a commercial success possible. There is not enough load carrying capacity. The larger the ship, the greater the proportion of load carrying to total lifting capacity. With larger ships, higher speeds will be possible with a proportional economy of fuel.

The aerial routes of the ocean have yet to be charted. The necessary meterological service from all parts of ocean highways have to be established and channels for reports maintained. The science of aerial ocean travel is as yet an unwritten book. Our over-ocean air craft experience is largely confined to the Vimy-Vickers stunt, to the NC-4 semi-stunt and to the R-34 voyage, which is the first tangible relationship between the stunt and semi-stunt and the commercial reality of to-morrow.

The R-34 trip has created an impression that was entirely lacking in the other two performances. It has acted as a kind of human radio, telling of what the near future may unfold. It is a warning to prepare, to be awake, to be active and not sloughful. It tells us that building the craft capable of the trip is far in advance of equipment and organizations needed on land to handle the service. It is indicative of what a herculean task is ahead and how necessary it is to start energetically to-day.

S. A. E. Men to Dine At Tractor Exhibit

Technical Men and Farmers to Discuss Practical Points of Operation

NEW YORK, July 9—Leaders in the tractor and farm implement manufacturing field, tractor experts and, possibly, a United States Senator will be speakers at the Society of Automotive Engineers dinner arranged for Thursday evening, July 17, in connection with the tractor demonstration next week at Wichita, Kan.

The dinner committee, which is engaged in making arrangements at S. A. E. headquarters here, hopes to present Senator Capper of Kansas. If he is unable to attend, an effort will be made to obtain as a speaker John Fields of Oklahoma, a technically trained tractor and agricultural expert, who has become widely known throughout the plains country by reason of his persistent advocacy of the use of tractors in farm development.

C. F. Kettering of Dayton, Ohio, past president of the Society, has promised to be toastmaster if he is able to be present, and two farm managers, whose names have not been announced, will talk on tractors from the farmers' point of view.

Scheduled speakers and their subjects are: Prof. L. W. Chase of the University of Nebraska, "Tractor Rating"; E. J. Gittins of the J. I. Case Threshing Machine Co., "Tractor Problems of Today"; L. C. Herring, tractor distributer at Des Moines, Iowa, "Maintenance and Related Problems from the Distributer's Standpoint"; E. A. Johnston, member of the S. A. E. council, "Work of the S. A. E. Standards Committee, Tractor Division, with Special Reference to Belt Speeds."

A meeting of the standards committee, tractor division, is tentatively set for Wednesday evening at the Hotel Dessen, where the dinner also will be held. It is not expected that the committee will reach the stage of deciding upon standards or recommended practices, but discussions will be held upon tractor belt speeds and the height of the tractor implement draw bar. The meeting will be open, and manufacturers will be invited to take part in the discussion.

G.M.C. ENGINE PRODUCTION

SAGINAW, July 8—Production of engines at the plant of the General Motors Corp. here is at the rate of 50 daily. Within 30 days this production will be run up to 200 engines and from then on the schedule will be increased until a production of 300 engines daily is obtained. These are 4-cylinder engines for light trucks and passenger cars.

PARTS FOR G.M.C.

SAGINAW, July 8—The Central Products Co., which has just been formed with a capital stock of $10,000, is in reality another General Motors Corp. enterprise. Those interested in it are H. L. Barton, T. S. Merrill and H. H. Rice, all G.M.C. officials. The company will make parts for G.M.C. passenger cars and trucks.

WORK ON WILLS-LEE PLANT

PORT HURON, MICH., July 8—Actual work has started on laying out the new Wills-Lee automobile factory just south of the city. Surveyors are at work and will also complete the layout plan for the new model city to be built here. The city will be known as Marysville, which is the name of the village at present on this site.

6500 OVERLAND WORKERS BACK

TOLEDO, July 8—Although more than half of the original Willys-Overland workers are still on strike, more than 6500 men are at work and production is getting under way. The strikers have made no trouble for the company since the injunction issued recently, which technically puts the plant under government protection.

New Porter Car On Market Soon

NEW YORK, July 10—Quantity production of the Porter car, which has been for more than four years in the experimental stage, bearing the initials of its originator, Finley R. Porter, will be undertaken in September. Manufacturing will be carried on at Bridgeport, Conn., by the American & British Corp., licensed by Porter, one of its directors, as exclusive producer of the machine during the next ten years.

About a dozen F.R.P.'s were put on the market before the industrial curtailment imposed by the war necessitated a halt in the experimental work. Porter having joined the engineering forces of the Curtiss Aeroplane & Motor Corp., his son, R. D. Porter, is carrying on the development as chief engineer of the A. & B. Corp. It is expected that production will reach 350 cars the first season.

The Porter, equipped with the Porter engine of more than 100 hp., will be manufactured complete at the Bridgeport plant, and will sell for about $5,000. Its passenger capacity has not been determined.

Distribution will be handled by the Morton W. Smith Co., New York.

UNITED MOTORS ADDS RIMS

DETROIT, July 8—The United Motors Service, Inc., with its 15 branches and 38 distributing stations throughout the country, will add the service of rims and rim parts to its account after July 1. The United Motors Service, Inc., is a unit of the General Motors Corp. and represents the Dayton Engineering Laboratories, the Remy Electric Co., the Klaxon Co., Jaxon Steel Products Co., Harrison Radiator Corp., Bearing Service Co. and several others.

French Import Tax Status Clarified

10 Per Cent Ad Valorem Added to Weight Impost on Heavier Types of Cars

PARIS, July 7 (*Special Cable*)—The French government is clear in its announcement that the import duty on motor cars is as follows:

Automobiles weighing a minimum of 5511 lb., 50 francs per 100 kilos, plus 10 per cent ad valorem.

Automobiles weighing less than 5511 lb., the tax remains at 70 per cent ad valorem.

The different information given out at Washington was a mistake.

French manufacturers have actively taken up the fight against the 45 per cent ad valorem import tax now levied by the United States on import of French machines. European countries are negotiating reciprocal duties on a basis of 15 per cent.

This means that the importer of a car weighing more than 5511 lb. must pay a duty of 50 francs (par value $10) on each 100 kilos (220 lb.), with an additional 10 per cent ad valorem levy.

A car weighing less than 5511 lb. will be taxed only on the 70 per cent ad valorem basis.

The information reaching the Bureau of Foreign and Domestic Commerce at Washington appears to be confusing, as no clear statement of the new duties has been given out there. The first statements issued have been subject to corrections.

ALLIS-CHALMERS EARNINGS

NEW YORK, July 10—Earnings of the Allis-Chalmers Mfg. Co. for the quarter ended June 30, are estimated in advance of the financial report at $1,000,000 above all charges, or at the annual rate of $11 per share in comparison with $11.06 in 1918.

TIN IMPORTS PERMITTED

WASHINGTON, July 8—Supplementing War Trade Board Ruling 780, issued June 16, the War Trade Board Section of the Department of State has announced that it will issue licenses permitting the importation, on or after September 1, of pig tin and all metal alloys containing tin, including tin drosses, tin oxides, solder drosses, type metals, antifriction metals, waste metals and other metals containing tin, from points other than points of origin and without reference to the date of shipment.

STEVENS-DURYEA RESUMES

SPRINGFIELD, MASS., July 10—The Stevens-Duryea Motor Car Co. has been re-organized and will resume manufacture in the near future.

Sale of Vehicles to France Held Up

Offer Made Considered Inadequate—May Be Sold to Other Countries

WASHINGTON, July 9—The sale to the French government of trucks, passenger cars and other automotive equipment belonging to the American Expeditionary Force in France has been held up as a result of what is considered an inadequate offer, according to Director of Sales C. W. Hare. Mr. Hare declared that the French government has offered only $300,000,000 for all American Army equipment in France, including automotive commodities, which it desired to purchase, and which has an aggregate cost value of $1,500,000,000.

As a result the sales have been suspended, and a small party of industrial experts under Mr. Hare will be sent to Europe to organize sales offices and organizations throughout the continent to dispose of the equipment, unless France makes a better offer.

Sales are planned to Belgium, Roumania and Poland. American aircraft in Europe will not be subject to Mr. Hare's disposal, but motor trucks, passenger cars, motorcycles, tractors and practically all other Army equipment will be either sold, or, if necessary, returned to the United States.

There are 9800 passenger cars, 7000 ambulances, 52,000 motor trucks, 22,000 motorcycles and 5700 trailers in France belonging to the American Expeditionary Forces.

TAKE OVER BUILDING EQUIPMENT

WASHINGTON July 7—The Department of Agriculture is sending a representative to France, James B. McCord, who will take over all surplus engineering and road building equipment to be turned over to the Department by the American Expeditionary Force, and who will arrange for its transportation to this country.

To Build Dirigible at Philadelphia Yard

PHILADELPHIA, July 9—A dirigible similar to the British R-34, to be built at the navy yard here, will attempt within a year a flight to Europe, Commander Coburn, in charge of aircraft production for the navy at this point, announced to-day. He also made public plans of the department to establish a landing field at Lakehurst, N. J., with hangars capable of housing balloons larger than any yet built.

An appropriation of $1,500,000 has been made for the new dirigible, for which plans are well under way, and Congress has been asked to set aside $3,700,000 for the hangars.

119 M.P.H. FOR AIR MAIL

WASHINGTON, July 8—The air mail was run to-day from New York to Cleveland in 3 hr. and 38 min., running time. The average speed was 119 m.p.h. for the entire distance of 430 miles, the flight being with a De Haviland plane of 400 hp. The first 215 miles from New York to Bellefonte, Pa., was made in 1 hr. and 28 min. and the second leg from Bellefonte to Cleveland, 215 miles, in 1 hr. and 50 min.

AIRPLANE FIRE PATROL

WASHINGTON, July 9—The California Aerial Forest Fire Patrol, which has organized airplanes engaged in forest patrol duty, is flying approximately 7500 miles per week. During the week ended June 28, the patrol discovered eight fires.

Dual Battery Ignition on New Pierce-Arrow

DAYTON, July 10—A new system of ignition and a new transmission are novel features of the new dual valve Pierce-Arrow Six, just announced.

The ignition is by double battery system, designed by the Delco Co. in collaboration with Pierce-Arrow engineers. According to Chief Engineer David Fergusson, the new system is as reliable as the magneto-battery, and entirely overcomes the difficulty of synchronization. Pre-ignition from the magneto at high speed no longer is possible. Instead, two timers and distributors, working in unison, give sparks simultaneously at all speeds.

Safeguards to conserve the battery current have been devised. When the car is left in a locked position the battery automatically is disconnected from the engine and the head lamps are shut off. The small bulbs used for signal purposes at night can be turned on, however. They consume so little current that there is no danger of battery depletion. The new transmission was designed to facilitate gear changing.

WHITE REPRESENTATIVE IN CUBA

NEW YORK CITY, July 9—G. A. Worrall, foreign service manager of the White Co., is making a trip to Cuba in connection with service matters.

ACTIVITY IN COLOMBIA

NEW YORK, July 10—A. N. Eslava, Buick agent and pioneer in the introduction of automobiles in Colombia, announces his intention of opening accessory and repair depots in the leading cities of the South American republic within a month. He will sail for home with two American mechanics, hoping to relieve a situation due to lack of repair facilities and supplies of parts, which has doomed to disuse half the limited number of cars in the country.

246,267 Vehicles in Motor Transport

Cars in France Only Few Greater Than at Home—21,885 in Peace Personnel

WASHINGTON, July 8—A total of 122,128 passenger cars, ambulances, trucks, motorcycles, bicycles and trailers form the motor transport strength of the United States Army in this country, with 124,139 in France, according to a statement by Brigadier General C. B. Drake at a recent Congressional hearing.

Of these, passenger cars in the United States total 9592, in France 9809; motor trucks in United States, 57,712, in France, 51,781, and motorcycles in the United States, 16,712, in France, 22,802.

Following is the itemized list:

	United States	France
Motor cars	9,592	9,809
Ambulances	5,167	7,089
Trucks	57,712	51,781
Motorcycles	16,140	22,802
Bicycles	9,974	26,867
Trailers	23,543	5,791
	122,128	124,139

Under the plans arranged for an army of 500,000 men on a peace basis the War Department will require 4182 passenger cars, 20,973 motor trucks, 10,170 motorcycles and 3591 trailers. The trucks will comprise ¾-ton, 1½-ton, 3-ton to 5-ton sizes, in addition to the 4-wheel drive types.

A 10 per cent working replacement of all vehicles is approved by the Secretary of War.

The Motor Transport Corps on a peace basis will include 20,737 enlisted men and approximately 1148 officers.

HUDSON GETS TRACTOR PATENTS

DETROIT, July 7—Considerable interest has been stirred up in automotive circles in regard to patents on tractor mechanism issued to S. G. Baits and S. I. Fekete, engineers of the Hudson company, and assigned to that concern. According to W. J. McAnenny, secretary and factory manager of the Hudson Motor Car Co., nothing active is contemplated in connection with the Hudson company entering the tractor business. He stated that whenever a new idea came to the engineering department it was patented regardless of whether it concerned automobiles or not. The patent referred to is No. 1,305,433, the principal claim being:

In a tractor the combination of an engine, an axle, driving wheels fixed to said axle, a spur gear on said axle between the said wheels, a spur pinion meshing with said gear, a change speed gear driving said spur pinion, and a frame which supports the said parts, the rear portion of said frame forming a housing for said rear axle, said spur gear and pinion lying within the periphery of said driving wheels and the housing being extended laterally beyond the planes of the adjacent faces of the said wheels.

General Upward Trend in Prices

Cars and Trucks Alike Raised—Locomobile Up $1400— Other Advances Likely

NEW YORK, July 8—A general upward trend in prices is evidently in progress from the recent announcements of both car and truck manufacturers of advances anywhere from $50 to $300 since the first of the month. Locomobile has announced a greater price jump than any yet received, advancing $1,100 on open cars and $1,400 on closed models with still greater increase on special body jobs, necessary, as explained by the company, to maintain and develop production up to customary standard under present costs. The new schedule of Locomobile prices brings the touring car from $7,000 to $8,100, the special 4-passenger touring from $7,100 to $8,200, the limousine and landaulet from $8,200 to $9,600, the chassis alone jumping from $6,000 to $7,100, and with custom built bodies coming as high as $11,000. The company will continue its policy of limited production.

Maxwell advance is $90 on all car types, raising the chassis from $805 to $895, and the car models as follows:

Model	New Price	Old Price
Touring	$985	$895
Roadster	985	895
Sedan	1 655	1,565
Coupé	1,610	1,520

Maxwell 1½-ton truck chassis has advanced $100, from $1,085 to $1,185, and the chassis with cab and windshield from $1,125 to $1,225.

Chalmers prices are $120 ahead on 5-passenger models and $150 on 7-passenger, all effective at once, as follows:

Model	New Price	Old Price
5-passenger		
Roadster	$1,685	$1,565
Touring	1,685	1,565
Sedan	2,370	2,250
Coupé	2.105	1,985
7-passenger		
Touring	1,765	1,615
Roadster	1,765	1 615
Limousine	3,075	2,925
Town Car	3,075	2,925
Limousine landaulet	3,175	3,025
Town landaulet	3,175	3,025

Cadillac is up on six out of thirteen of its models, open touring models remaining the same and will probably continue so, but enclosed cars increasing from $100 to $300.

As already stated in the July 3 issue of AUTOMOTIVE INDUSTRIES, Studebaker has gone up $100 on touring and open models, and $150 on closed cars, and Hudson inaugurated an advance of $125 on all models, with a $200 rise in the Essex Phaeton from $1,395 to $1,595, the 5-passenger sedan remaining $2,250

The price of the Oldsmobile eight has been increased from $1,795 to $1,895. Although the price of other models remains unchanged, every indication points to extension of the increase in the immediate future. The Chevrolet Motor Co. it is rumored, will inaugurate a new and higher price schedule on all models in August.

The Paige-Detroit Motor Car Co. will bring out its new series very shortly, and it is altogether probable that the price will go up within 30 days. The Hupp Motor Car Corp. prices have been guaranteed until Aug. 1.

The general price increase has affected the truck industry as well as the passenger car business. It is due entirely to the cost of material and labor. The price of axles, pressed steel frames, steering gears, stampings and the majority of other automobile parts are up from 15 to 40 per cent.

Truck advances are adso in effect. Autocar has added $250 to its 97- and 120-in. wheelbase trucks, making the price $2,300 for the former $2,050 model and $2,400 for the $2,150 model, effective Aug. 1.

Rainier body prices remain unchanged, but the following chassis prices will prevail:

Model	Ton	New Price	Old Price
R-11	¾	$1,750	$1,550
R-9	1	1,875	1,790
R-6	1½	1,975	1,890
R-8	2	2,400	2,250

All models now have Continental engines and Brown-Lipe clutch and transmission. The ¾-ton has 35 x 4½ pneumatic tires and heavier Timken worm-driven rear axle. Bosch electric lighting equipment is furnished extra at $125

Maxwell 1½-ton chassis, as already stated, has advanced $100, from $1,085 to $1,185, and with cab and windshield, from $1,125 to $1,225. The White Co. has raised the price of its ¾-ton truck chassis from $2,300 to $2,400, and its 3- and 3½-ton from $4,100 to $4,300. The 2-ton model remains $3,300 and the 5-ton $5,000.

Although price advances have not yet been announced by a number of companies it is generally expected that a good many price changes will take place within the next 30 days.

Wolseley Adds New Interests

LONDON, ENGLAND, June 20 (*Staff Correspondence*)—Changes involving the Wolseley Co. and certain subsidiary interests are taking shape, and it is rumored that this company will take over the Ward End Works of the Electric & Ordnance Accessories Co., Ltd. This change involves all the British interests in the Timken roller bearings, which are associated products of the Ordnance Accessories Co., Ltd.

The next step will be the transfer of the B. L. I. C. (formerly Bosch) magneto, dynamo and electric starter interests, until now concentrated in the former Bosch Co.'s works on Tottenham Court Road, London. This branch of business will be transferred and concentrated at Birmingham.

The Wolseley Co.'s works will shortly spread over 100 acres.

Armstrong-Siddeley Plans New Light Six

Car Listed at $3300—Program of Production and Service Inspection Free

LONDON, ENGLAND, June 20 (*Staff Correspondence*)—The recent development in the Armstrong-Whitworth and Siddeley-Deasy interests was followed by a statement of program and an announcement of a change in the title of the latter company.

Following are the pacticulars as just promulgated: The Armstrong-Whitworth Co., Ltd., have acquired a controlling interest in the Siddeley-Deasy Car Co., Ltd., and propose to continue the Armstrong-Whitworth motor car department, at the works of the Siddeley-Deasy Co. at Coventry. The joint interests will be styled the Armstrong-Siddeley Co., Ltd., and the car to be produced under the joint auspices will be styled the Armstrong-Siddeley car.

Features of New Car

The features of the car are promised, as far as is commercially possible, to embody aircraft engine and aircraft materials with which the Siddeley-Deasy Co. were associataed during the war.

A guarantee to be issued with the cars will include free periodical inspection, operating through an extended system of service departments, two of which are already existent in London and Manchester, in the form of small self-contained works with experienced staffs and fully-equipped repairs and service plant.

Additional service departments will be opened shortly at the works of Sir W. G. Armstrong, Whitworth & Co., Ltd., at Elswick, Newcastle-on-Tyne, at Openshaw, Manchester, and at Glasgow, and probably others, particulars of which will be announced later. Present service departments are: London: 1, Beare Lane, Southwark, S. E., for Armstrong-Whitworth cars, and 78, Marylebone Lane, Wigmore Street, W., for Siddeley-Deasy cars; Manchester, Great Northern Garage, Watson Street.

The new Armstrong-Siddeley car will be a reasonably light 6 and the chassis will be listed at £660 ($3,300), including electric starter and generator, five lamps, four tires with new type disk wheels and wheel-guards and a dash with the electric and other instruments.

It will have a new design of frame, radiator, and bonnet; improved front-axle and steering; spiral-bevel rear axle drive; Siddeley cantilever-type springing; all brakes on rear wheels, and new type disk wheels with big tires. The engine will have a bore and stroke of 3½ in. by 5¼ in., and overhead valves. Aluminum will be used largely.

RANTOUL, ILL., June 27—A school has just been established at Chanute Field where mechanics will be instructed in airplane and engine details.

N. A. C. C. Opposes Automobile Taxes

Adopts Resolutions Urging Repeal of Special Levy on All Automotive Products

NEW YORK, July 5—Coincident with an announcement that Representative Kraus of Indiana had introduced in Congress a bill to insure limitation of the revenue tax on motor trucks, chassis and parts to 3 per cent of the manufacturers' sale price, the National Automobile Chamber of Commerce announced to-day that resolutions had been adopted and forwarded to members of Congress urging repeal of the special levy on all classes of automotive products.

The Kraus bill, intended to eliminate the taxation of parts and chassis for motor trucks on the 5 per cent basis applicable to passenger cars, provided in the present bill because of the contention of revenue experts that certain of these classes of products might be used on passenger as well as commercial vehicles, specifically names "automobile trucks, automobile wagons and chassis thereof (including tires, inner tubes, parts and accessories therefor)," as coming within the 3 per cent rate.

In its petition for the repeal of the automobile taxation clauses as a whole, the N. A. C. C. terms the measure discriminatory, through the fact that similar assessments are not laid upon manufactured articles generally. Quoting the recommendation of President Wilson in his message to Congress in favor of the elimination of the taxes, the association declared that the levies were a burden to the industry in its efforts to resume operation on a peace basis.

BRITISH WANT CARS

NEW YORK, July 3—The British market, which gives evidence of a growing demand for American cars, is in the field through the London & Midland Motors, Inc., for 5000 machines annually of the light 4- and 6-cylinder, 2- and 5-passenger type. A. J. Foster, representing the company, is in New York, seeking through the N. A. C. C. and directly by contact with manufacturers, to arrange for the shipment of the cars mentioned, together with 1- and 3-ton trucks. Right hand steering is specified for the passenger cars.

LONDON VEHICLE SHORTAGE

LONDON, July 7—The decision of the Home Secretary on the proposal to suspend for two years the regulation forbidding the use of motor-cabs in London having an axle clearance of less than ten inches is expected shortly. If this restriction is raised, it will enable a number of French taxicabs to be put on the streets of London. At present there is a marked shortage of these licensed cabs, the number having fallen from 7260 in 1916 to 3821 in 1918. Correspondingly the number of licesed drivers has fallen from 9082 to 5476 in the same period.

A State Committee began an official inquiry this week into this and other matters concerned with the present congestion of traffic in the metropolitan area. There is a similar shortage of buses as revealed by the foregoing taxicab figures, the number of licensed motor buses having fallen from 3057 in 1914 to 2277 on Dec. 31, 1918. Sice then the number was increased by 1325 up to May 31, of which between 160 to 170 were new, the rest being repaired buses and some of them ex-war vehicles refitted.

ENGLAND LICENSES FRENCH CARS

WASHINGTON, July 3—British regulations provide for application for motor licenses for cars, motorcycles and parts imported from France, according to announcement made here to-day by the Department of Commerce.

FOREIGN COMMISSIONS HERE

WASHINGTON, July 3—Arrangements are being made for purchasing commissions from the governments of Serbia, Poland and Roumania to visit the United States for the purpose of purchasing large amounts of Army surplus stocks.

AMERICAN CARS IN CALCUTTA

WASHINGTON, July 3 — American passenger cars are predominant in Calcutta, according to a report from the Department of Commerce. There are 4000 privately owned cars and 500 taxicabs. Since the signing of the armistice and removal of the import embargo, all passenger cars imported into the city have been of American manufacture.

MARKET IN STRAITS SETTLEMENTS

WASHINGTON, July 3—That a market for motor trucks, motor rickshaws, rubber tire repair machinery and tractors exists in the Straits Settlements has been reported by the American Consul to the Department of Commerce. A letter forwarded from the president of the Chamber of Commerce of Penang also requested catalogs of all automotive products.

TRADEMARKS IN CHINA

WASHINGTON, July 3—Trademark registration in China after Aug. 1 will cost $7.50 Mexican money, according to announcement by the Consul General of Shanghai.

TRADE WITH CZECHO-SLOVAKIA

WASHINGTON, July 3—The province of Slovakia, as well as the provinces of Bohemia and Moravia, may be considered as included within the territory of Czecho-Slovakia, according to a statement of the War Trade Board, which also states that trade between Czecho-Slovakia and the associated governments was re-established on Feb. 13, 1919.

The War Trade Board Ruling 594 is therefore amended by the inclusion of the province of Slovakia.

May Internationalize Screw Thread System

Engineers Going to European Conference in Hope of Bringing About Identical Standard

NEW YORK, July 5—Hope of establishing an international screw thread standard is the motive underlying arrangements for a conference of automotive and mechanical engineers of several countries to be held in London late this month. The American delegates, including Henry L. Horning, chief engineer of the Waukesha Motor Co., and Earle Buckingham of the Pratt & Whitney Co., will sail about July 12, meeting the European conferees in London and touring sections of England and France in the course of their investigations.

The conference will make an exhaustive study of screw thread systems in use abroad, with good reason to believe, according to officers of the Society of Automotive Engineers, that agreement on an international standard will prove possible.

Frank O. Wells of Springfield, Mass., and Luther D. Burlingame of Providence, R. I., will represent the American Society of Mechanical Engineers on the mission.

LIST SPANISH DEALERS

WASHINGTON, July 3 — The Bureau of Foreign and Domestic Commerce, Department of Commerce, has compiled a list of dealers in automobiles in Spain, and will forward it upon request and mention of file No. 30,713.

SHIPS TO AID FLYERS

WASHINGTON, July 7—Vessels will give longitude and latitude to transatlantic flyers whenever occasion arises, if suggestions made by the National Advisory Committee for Aeronautics of the U. S. Shipping Board are carried out.

The Advisory Committee has recommended that all ships flying the American flag should be instructed to give all navigation assistance of this nature at all times in the future to transatlantic flyers, and has asked the U. S. Shipping Board to convey the recommendations to all ocean going vessels carrying the flag of the United States.

NEW COMPANY TO MAKE CASTINGS

DETROIT, June 7—Horace Mills, Everitt Betts and Walter O. Adams have formed the Mills-Betts-Adams Foundry Co. Temporary offices have been opened. The company will manufacture grey iron castings.

JULIUS BLUM MOVING

NEW YORK, July 3—Julius Blum & Co., now at 510-512 West 24th Street, will move to the warehouse, 125 by 100 ft., 5-stories, at 532-540 West 22nd Street.

New 100-Mile Record Made by Chevrolet

Drives Frontenac Over Sheepshead Bay Course in 54 Min., 17⅛ Sec.

SHEEPSHEAD BAY SPEEDWAY, N. Y., July 4—Gaston Chevrolet made a new world's record—54 min., 17⅛ sec. for 100 miles—in the Independence Day sweepstakes here today.

Driving his 4-cylinder speedster around the course without a single stop, and at an average speed of 110.5 m.p.h., the winner clipped three seconds off the record established by his brother Louis in a machine of similar type in the Harkness Trophy competition here in 1917.

The Frontenac functioned perfectly from start to finish. Escaping tire trouble, the predominant factor in forcing his rivals to the pits, Chevrolet declared his motor worked so smoothly that he could have cut his time down near the 50 minute mark had he not eased up after Joe Boyer in another Frontenac, his chief competitor, quit the race owing to engine trouble in the 33rd lap.

Howard Wilcox, who drove a 4-cylinder Peugeot to victory at Indianapolis in May, finished second in the same car, in 58 min., 37⅝ sec., four laps behind the winner, and Dave Lewis in a Meteor, equipped with an 8-cylinder Deusenberg motor, was third.

The plank track, though far from perfect, had been put in fair condition by extensive repairs since the last day's racing, and was speedy, proving a factor in the making of a second record—5 min., 22 1-5 sec. for 10 miles—by Wilcox in the first and only heat of a special 3-heat race scheduled between him and Ralph de Palma in his 12-cylinder Packard. After this sprint, which Wilcox won by less than a foot, de Palma discovered a cracked piston which brought the match event to a conclusion and prevented the Packard's entry into the 100-mile race.

ELGIN RACE PLANS

CHICAGO, July 7—Arrangements for resumption of the Elgin Road Races August 23 nave been concluded and entry blanks will be out next week. Eight entries have been definitely promised. The race will be for 308 miles on the 8.6 mile course and will be limited to 300 cu. in. cars. Prizes will total $8,000, split five ways with probably first prize at $5,000. Original plans contemplated two days' events, but it has been decided to have but one day and one race.

RACE IN SICILY

PARIS, June 20—An automobile race around the Island of Sicily for the Targa Florio is announced for fall. Before the war this was one of the European classics. Chevalier V. Florio, donor of the cup and organizer of the race, says that he hopes to revive the event during the year on a short course of 60 miles, which will be covered four times by all classes of cars. As this race will be run only a few weeks before the automobile shows open in Europe, it is believed that it will attract considerable attention.

In addition there will be a hydro-airplane race around the island at about the same time.

M. A. M. A. MEETING POSTPONED

NEW YORK, July 10—The Motor & Accessory Manufacturers' Association meeting called for this week at Buffalo, to discuss credit and general business conditions, has been postponed till fall. It will probably be held the second week of September, with topics of interest to credit managers predominating.

RECRUITS FOR AIR SERVICE

WASHINGTON, July 3—The Air Service is seeking 15,000 recruits between the ages of 18 and 40 and is particularly desirous of securing electricians, aviation mechanics, engine makers, propeller makers, magneto repair men, fabric workers, etc. Applicants can address Captain Chas. J. Glidden, Air Service, U. S. Army, Washington, D. C.

RADIOS FOR AERIAL MAIL

WASHINGTON, July 8—The Post Office Department has closed a contract with the manufacturer of radio apparatus, for the erection of three high powered wireless stations. These stations erected at Bellefonte, Pa., Cleveland, Ohio, and some point on Long Island, will be used in directing mail-carrying airplanes handicapped by the fog or other weather conditions.

The stations will have a range of 400 miles. The steel towers will be 200 ft. in height, the distance between the stations bing approximately 700 miles.

FRENCH PACKARD AGENCY

PARIS, June 15 (*Staff Correspondence*)—Maurice Bayard-Clement, son of the French automobile manufacturer, has taken up the exclusive selling agency in France for the Packard and will open showrooms in the Avenue des Champs-Elysées. Bayard-Clement is now in America.

From inquiries made at the Bayard-Clement factory it was learned that although Bayard-Clement is associated with his father in the manufacture of automobiles, this agency does not in any way concern the company.

J. Green, Packard service agent in France, states that he has received no official notification of the agency having been granted to Bayard-Clement.

Previous to the war, Packard maintained its own service and sales department in Paris. During the war the agency has been handled by Gaston, Williams & Wigmore.

WHITE IN LONG ISLAND

LONG ISLAND CITY, July 10—A combined sales and service station of the White Co., employing 400 to 500 persons, is being erected here. It will give up its New York headquarters at Park Avenue and 57th Street about Dec. 1.

Chevrolet Winner on Tacoma Track

TACOMA, WASH., July 4—Louis Chevrolet, driving a 4-cylinder Frontenac, won the 80 and 60-mile races on the 2-mile plank track here. Ralph Mulford in another Frontenac captured the honors in the 40-mile event. No records were established, the winning cars averaging about 100 m.p.h.

148.44 M.P.H. BREAKS RECORD

WASHINGTON, July 8—The non-stop speed record between San Francisco and San Diego, Cal., was broken yesterday when a distance of 610 miles was covered in 246½ min., which is at the rate of 148.44 m.p.h. The flight was made by Capt. L. H. Smith in a De Haviland equipped with a Liberty engine.

DuPONT 4-CYLINDER CAR

WILMINGTON, DEL., July 8—The first car to be made by the duPont Motor Manufacturing Corp., recently formed with E. Paul duPont as president, will be a 4-cylinder model. It is hoped to have it ready for the next New York automobile show. A 6-cylinder car may follow. Nothing has been decided about the location of a plant, and the main office of the company is at 904 Market Street. It has been capitalized for $200,000.

E. Paul duPont, president, is connected with the Ball Grain Explosive Co., of which Alfred I. duPont is president, and he is president of the Delaware Marine Motors Co. Arthur M. Maris, vice-president and general manager, was with the Biddle Motor Car Co., Philadelphia, until he went to war in 1917. John A. Pierson, chief engineer, was formerly with the Wright-Martin Aircraft Corp. The new concern has no connection with the duPont interests which control General Motors.

AUTOMOBILE FATALITIES

WASHINGTON, July 7—A reduced death rate from traffic accidents in New York City, compared with that of other cities, has been found as a result of investigations by the Highway Transport Committee. Investigations directed chiefly through the police department show, for example, that in Washington, D. C., traffic deaths increased from 33 in 1916 to 52 in 1917, 73 in 1918 and at the rate of 82 per year for the last six months of 1918 as compared with 644 in New York in 1916, 714 in 1917 and 679 in 1918.

The death rate in Washington for the last six months was at the rate of 82 per year on the basis of 425,000 inhabitants and was consequently 90 per cent greater than the 679 deaths in New York on the basis of 6,000,000 inhabitants. The committee is making inquiries in other cities to determine if the average in the United States is similar to that found in the national capital.

Motor Car Paper in Reserve Banks

Dealers Are Placed on Same Standard as Other Lines of Business

ST. LOUIS, July 7—The acceptance of the commercial paper of a motor car dealer by Federal Reserve Banks is based upon the same principles as govern the acceptance of paper of every other business; that is, the dealer individually must be a good risk and the collateral approved. The Federal Reserve bank of St. Louis has thus advised the National Automobile Dealers' Association, quoting a reserve bank ruling uniform throughout the country and issued March 1, 1918.

This opinion, which was sought by the N. A. D. A. to clear up a misunderstanding that has arisen as to the policy followed by reserve banks toward the motor car dealer, makes it clear that the paper of the motor car dealer is just as good as that of a dry goods merchant, or a machinery man or other dealer.

The reserve bank does not directly concern itself with motor car dealers' paper. When a dealer sells a car on time he usually takes a note for the remainder of the purchase price. This note, which is secured by a mortgage on the car, is taken to the bank and sold by the dealer after he indorses it.

"When the bank wishes to replace the money taken out of its vaults for the dealer," Harry G. Moock, business manager of the N. A. D. A., explains, "it goes to the Federal Reserve Bank with its own paper, with the note turned in by the dealer as collateral for deposit. This means then that the Federal Reserve Bank has as its security first the paper of the member bank, then the security of the member bank as guarantee of the customer's note, then the indorsement of the dealer on the customer's note and lastly a lien upon the car, affording it virtually a four-ply security."

Mr. Moock explains that the reason for some of the inference against the motor car dealer's paper with the Federal Reserve banks is believed to have been the result of a ruling refusing to take the paper of a New York motor car finance corporation, but which in no way affected the finance corporation's ability to obtain loans on their security, although keeping this security from being rediscounted at the reserve banks. The Federal Reserve decision follows:

"Notes of Finance or Credit Companies.

"The Federal Reserve Board has received and considered your letter of February 6 (1918) relating to the right of a Federal reserve bank to rediscount the collateral notes of a certain corporation.

"The Federal reserve act authorizes any federal reserve bank to discount a note or bill drawn for an agricultural, industrial, or commercial purpose; that is, a note or bill, the proceeds of which have been used, or are to be used for such purpose.

"The Federal Reserve Board has always ruled, therefore, that the note of a finance or credit company, which is drawn either directly or indirectly to finance some industrial or commercial concern in the transaction of its business is not eligible for rediscount, even though it may be secured by paper which is itself eligible for rediscount.

"Congress has made a very evident distinction between the two kinds of paper, and this distinction was emphasized when an amendment to the Federal Reserve act was passed last year expressly authorizing Federal reserve banks to rediscount the note of a member bank when secured by eligible paper, but this amendment was specifically limited to notes of a member bank and cannot be construed to authorize the rediscount of notes of any sort of financial institution, even though most adequately secured by paper which is itself eligible for rediscount.

"The board must, therefore, necessarily rule that the note of a credit company, even if secured by eligible paper, is not eligible for rediscount if its proceeds are not used for one of the purposes specified in the law."

NEW YORK-CHICAGO AIR ROUTE

WASHINGTON, July 3—The establishment of an air mail route between New York and Cleveland, connecting with the system from Cleveland to Chicago, was announced to-day by Second Assistant Postmaster General Praeger. A fast flight was made on the first journey when 110 m.p.h. were averaged for a distance of 430 miles. The planes stop at Belfont, Pa., from which point another plane takes the mail to Cleveland.

Mail can now be sent by airplane from New York, leaving at 5 a. m. and reaching Chicago at 1 p. m. About 13,000 letters per day are being taken for Pacific Coast points and are being advanced 24 hours by the air mail to Chicago. Likewise air mail from the West for New York is taken on in Chicago and Cleveland and advances delivery many hours. Most of the planes used are remodeled De Haviland 4's with Liberty engines and with capacity for 400 lb. of mail each.

DETROIT-TOLEDO AIR MAIL

DETROIT, June 28—Toledo and Detroit are planning a daily aerial mail service. The proposed air-route is to start at Detroit, go to Toledo and from there to Chicago.

AIR MAIL FOR COLOMBIA

WASHINGTON, July 7—Bids have been asked for the carrying of mails by airplane between the larger cities of Colombia, S. A., by the Postmaster General of that country. Roads will operate between Bogota and Barranquilla, touching at Manizales, Madellin and Cartagena, another road between Bogota and Pasto, touching at Manizales, Cali and Popayan; another between Bogota and Cucuta, touching at Tunja and Bucaramanga.

Bids are to be opened Nov. 20, 1919. American manufacturers interested can secure details from the Colombian Legation of this city.

CROSS COUNTRY FLIGHT

WASHINGTON, July 3—Four De Haviland battle planes with Liberty engines will soon make a flight from Ellington Field, Houston, Tex., to the Pacific Coast and then east to the Atlantic Coast, with a return trip to Ellington Field. Practically all important cities will be visited enroute.

American is Ford Manager in London

W. C. Anderson, Former St. Louis Manager, Succeeds Sir Percival Perry

NEW YORK, July 5—Resignation of Sir Percival Perry as head of the Ford interests in Great Britain has been followed by appointment of an American to the place, it was learned here today. The new director is Warren C. Anderson, who has been in the Ford service many years, as manager in St. Louis for twelve or more, and the past year in charge of the Chicago office.

Sir Percival Perry, according to Ford headquarters here, will remain with the British organization, in charge of the Fordson tractor work, to which he gave much time during the war, promoting its use generally and through the Food Production Department of the Government.

NO PART IN AIRCRAFT STANDARDS

WASHINGTON, July 3—As a result of action by the House, the plans for American participation in the International Aircraft Standards Commission Conference have been dropped. This conference, which was started during the war when delegates from all of the allied countries met in London and conferred on problems of aircraft standardization, is to be permanent, with a central office in London.

The provision for American participation was included in the army appropriation bill appropriating $1,000 towards the maintenance of the office and $50,000 for the expenses of delegates. As a result of the refusal of the House to agree to the provision as incorporated in the Senate army appropriation bill, this section of the bill was eliminated and participation of America in Standards Conferences ended.

An attempt will be made next year to secure appropriations for participation of American delegates for 1921.

AVIATION IN SOUTH AFRICA

WASHINGTON, July 7—Commercial aviation will be established in South Africa between Johannesburg, Pretoria, Cape Town and Durban by the South African Aerial Transports, Ltd., which has been organized with a capital of $486,650.

The Government is giving full support to the concern and plans are considered for granting the company contracts for carrying mail throughout the Union. Passenger carrying airplanes are sought by the company, which has already ordered four airplanes, each capable of carrying a load of 6,000 lb. in addition to a crew of two pilots and a mechanic. There machines will average 80 m.p.h., including stops, and expect to make the journey between Pretoria and Cape Town in 12 hours.

P. & O. PLANT REOPENS

CANTON, ILL., July 8—The plant of the Parlin & Orendorff Co., recently purchased by the International Harvester Co., has been reopened after a shutdown of several weeks for inventory and repairs. C. B. Reed has been appointed superintendent of the plant. The formal transfer from the old to the new regime was made on July 1. The force of employees is being increased and the plant will be operated on a larger scale than ever.

MOTOR CASTINGS BUILDING

MILWAUKEE, July 7—The Motor Castings Co., which is breaking ground for a new foundry in West Allis, is a new $100,000 corporation organized by Gustave Anderson, formerly works manager of the Wisconsin Aluminum Foundry Co., Manitowoc; Arthur C. Swallow, and John S. Wilson. It will specialize in gray iron and semi-steel castings, the principal products to be cylinder castings, flywheels, crankcases and brackets. Work on the plant will start at once and pushed so that the first metal will be poured about Sept. 1. One cupola will be provided with a capacity of 300 tons a month. The building will be 111 x 180 ft., leaving room for a second cupola later.

STUDEBAKER FINANCES

NEW YORK, July 10—The Studebaker Corp., which produced upwards of 17,000 cars during the first six months of the year, earned $4,200,000 before taxes were subtracted, up to June 30. The earnings up to date coincide generally with those of 1918. The production schedule calls for 40,000 cars before Dec. 31.

AGENTS FOR LYONS FAIR

WASHINGTON, July 8—The American Express Co. has been appointed official forwarding agents in the United States for the Lyons fair.

Truck Train Starts Cross Country Trip

60 M. T. C. Trucks Left Washington July 7—To Reach San Francisco Sept. 1

WASHINGTON, July 7—The first transcontinental motor truck journey started to-day when 60 U. S. Motor Transport Corps trucks left here, following dedication of the milestone at which various Highway and Army officials and members of the automotive industries participated.

It is to be self-sustained and self-maintained, carrying sufficient foods, repair parts, and road and bridge building equipment so that it can proceed without assistance from any outside sources.

Officials present included Secretary of War Newton D. Baker, General Peyton C. March, Brigadier General Charles B. Drake, Chief of the Motor Transport Corps; A. G. Batchelder of the American Automobile Association; F. A. Seiberling, president of the Goodyear Tire & Rubber Co.; W. B. Rutherford, president of the B. F. Goodrich Co.; Roy D. Chapin, president of the Hudson Motor Car Co.; S. M. Williams, president of the Highway Industries Association; Dr. B. M. Johnson, Highway Commissioner for New Mexico, and others.

Frederick, Md., will be the first stop of the train which will spend the night there, proceeding then to Gettysburg, Wooster, Ohio; Ft. Wayne, Ind.; Chicago Heights, Ill.; Marshalltown, Iowa; Omaha, Neb.; Rawlins, Wyo.; Salt Lake City, Utah; Ely, Nev., and Oakland, Cal. The journey starting to-day is expected to be completed Sept. 1 with arrival at the terminus, San Francisco.

Two motor truck corps companies, comprising 210 men and ten officers, with Captain McMahon in charge, and one detachment of engineers of 30 men and two officers, together with one medical detachment, one field artillery detachment and representatives of the Coast Artillery and Air Service, comprised the personnel. H. C. Osterman, vice-president of the Lincoln Highway Association, will travel in the pilot car from two to ten days ahead of the convoy.

The purposes as outlined by the Motor Transport Corps are to prove the need and value of good roads, stimulate enlistments, exhibit the Motor Transport war work to the general public and study road and general terrain conditions.

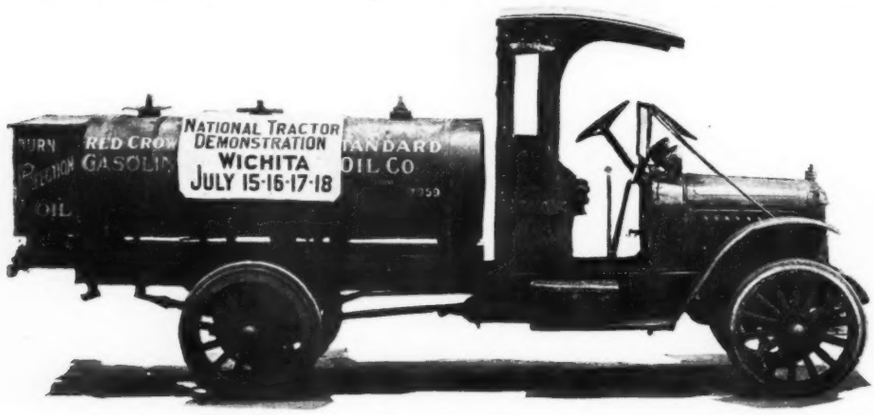
The convoy equipment includes two companies, Company A comprising 1 Dodge passenger car, 1 White passenger, 1 heavy G.M.C. ambulance, 1 Harley-Davison solo motorcycle, 2 Harley-Davidson side car motorcycles, 3 Mack, 3 Riker, 3 F.W.D., 3 Packard trucks, 3 Standard B, 1 3-ton White, 2 light delivery Dodges and 1 machine shop truck. There will also be included one kitchen trailer and one tank truck.

Company B equipment includes 1 Dodge, 1 Cadillac and 1 Reconnaisance White passenger cars, 1 heavy G.M.C. ambulance, 1 Indian solo motorcycle and 2 Indian side car motorcycles. The truck equipment comprises 6 1- and 1½-ton Whites, 2½-ton G.M.C., 7 3-ton Standard B, 2 light delivery Dodges, 1 tank, 2 water tanks, 1 engineering shop, 1 office work and 1 searchlight truck, together with a kitchen trailer.

Speeches will be made en route calling attention to the value of highways and also to the value of enlistments in the Motor Transport Corps and posters will be left in each town to mark the permanent trail of the Motor Transport train across the country.

Standard Oil Boosts Tractor Demonstration

WICHITA, KAN., July 7—Three hundred tank service wagons of the Standard Oil Co, whose routes cover the entire state of Kansas, are placarded as shown in the picture above in a unique free advertising campaign for the Wichita tractor demonstration. During the two weeks preceding the demonstration the wagons will visit every farm house once a week and all towns and cross roads daily. The scheme is being carried out, according to the company, in the interests of better farming.



G. M. C. EARNINGS

NEW YORK, July 10—Financial journals estimate earnings of the General Motors Corp. during the first six months of the year at $20,000,000, allowing for the same taxation charges as last year. As operating profits were in excess of $45,000,000 it is apparent that taxes are still cutting heavily into income. The company has prospects of turning out 500,000 passenger cars in the next twelve months.

G. M. C. STOCK WIDELY SOLD

NEW YORK, July 10—Thirty million dollars of debenture 6 per cent stock of the General Motors Corp., issued under the new capitalization of $1,020,000,000, has already been sold, the distributing syndicate announced to-day. The transaction added approximately 6000 shareholders to the G. M. C. list, a fair share of whom are Europeans.

HOOD STOCK SUBSCRIBED

BOSTON, July 10—A recent offering of $1,000,000 Hood Rubber Co. preferred stock was oversubscribed 25 per cent. The issue was the final fifth of $5,000,000 authorized in 1917, of which the balance was sold in that year.

Scene of English Tractor Trials for September

View of the land selected for the first day's tractor and implement trials to be held in September by the Society of Motor Manufacturers and Traders, Ltd., of London. The County of Lincoln is one of the flattest in England

CHASE TRACTORS IN CANADA

TORONTO, July 3—The tractor interests of the Chase Motor Truck Co., Syracuse, N. Y., have been purchased by a Canadian organization, headed by the Cluff Ammunition Co. of Toronto. A new company will be organized, to be known as the Chase Tractor Co., to produce the Chase tractor. A plant will be established here.

NEW TRACTOR ENGINE CO.

PETERSBURG, ILL., July 3—The W. A. Carrell Motor Co. has been organized to manufacture engines for tractors and other motor vehicles. Some of the models will be exhibited at the Wichita, Kan., tractor demonstration.

C. W. Shipley is president and other officers are: Vice-president, W. A. Carrell; secretary-treasurer, W. Y. Ramsey. The officers, with H. J. Aden, A. W. Hartley, S. W. Thompson and H. Aochte, form the board of directors. A plant site has been selected and buildings are expected to be erected this summer.

RELIABLE ENGINE, INC.

PORTSMOUTH, OHIO, July 3—The Reliable Tractor & Engine Co., formerly the Reliable Engine Co., has been incorporated for $2,000,000 by C. Heer, F. E. Adams, George W. Platt, F. N. Tynes and M. Heer. The company has been making the Reliable 10-20 tractor using kerosene oil, and 2-cylinder opposed stationary and portable engines, in a limited way, and with increased capital it is expected to launch these models more extensively.

TRACTOR MARKET IN NORWAY

WASHINGTON, July 7—There is a market for American tractors in Norway, but it is rather limited by the small percentage of arable land, according to a report by Trade Commissioner N. A. Bengston of the Bureau of Foreign and Domestic Commerce. One American company sold 250 tractors in Norway during the past 3 years, according to the report, and in the last 2 years the Norwegian Government has purchased 200 tractors and resold 150 of them directly to Norwegian farmers at cost.

American tractor manufacturers, states the Trade Commissioner, should look upon the Scandinavian market as a unit. A general agency established in any one of the three countries could easily handle the business for all. The location of the agency should be in Sweden or Denmark preferably, as the agricultural conditions there are most favorable for tractor use.

The area of Norway, approximately 125,000 sq. mi., includes a cultivated area of about 3500 sq. mi., which is located mostly in small strips along streams and lakes. One of the largest purely agricultural districts located near Stavanger is only 450 sq. mi. in extent. The Norwegian fields are small, hilly and cut up into small units by stone fences.

TRUCK TRAIN ROUTE

CHICAGO, July 7—The National Truck Development Tour, planned by the National Association of Motor Truck Sales Managers, will leave Grant Park on Aug. 4. The entire tour is expected to take 60 days, reaching six states and such cities as Dubuque, Cedar Rapids, Des Moines, Bismarck, Grand Forks, Fargo, Minneapolis, Madison, and Milwaukee. Trucks have been entered by 18 factories, and all will be pneumatic tired.

FORDSON ON 30 DAY TRIAL

WICHITA, KAN., July 7—The O. J. Watson Motor Co., of Wichita, is operating a Fordson tractor continuously for 30 days and tabulating results. The machine had been running 17½ days or 420 hours up to July 3 with a loss of 5½ minutes. At that time the motor was stopped to clean the fuel line which was chocked. Prior to this halt, the tractor had run 15½ days or 372 hours without a halt.

It has cut 310 acres of grain, ploughed 30 acres, disked 20 acres, brilled 10 acres and dragged 44 miles of road. It had passed through several hard rainstorms. The tests are being supervised by representatives of the Kansas State Agricultural School and the Wichita Chamber of Commerce.

500 FORDSONS A DAY

DETROIT, July 7—Henry Ford & Son Co., Dearborn, is now producing between 200 and 250 tractors daily and is rapidly running up production with the expectation of turning out 500 machines daily before the end of August.

IRON HORSE TRACTOR

TORONTO, ONT., July 3—The Siemon Tractor Corp. has been licensed to carry on operations in the Province of Ontario, and will have its plant at New Hamburg, Ont. It will manufacture the Iron Horse tractor, a two-plow machine.

SAMSON TRACTOR PRODUCTION

JANESVILLE, WIS., July 3—Production of Model M Samson tractors has reached 30 to 40 a day. The second unit of the assembly plant is nearing completion and will be ready for occupancy within 30 days. This will give the company a plant for assembly purposes 440 x 500 ft., and will increase production. The company is figuring upon turning out tractors at the rate of 200 to 300 by late midsummer.

HACKETT CAPITAL INCREASED

GRAND RAPIDS, MICH., July 7—The stockholders of the Hackett Motor Co., at their annual meeting July 2, authorized the extension of the capitalization to $3,000,000. The present capitalization is $500,000.

The company has contracts now in production which will keep the factory busy until Aug. 1.

Directors were elected as follows: J. F. Johnston, Grand Haven; W. W. Schantz, Grand Rapids; J. L. Dornbos, Grand Haven; John Boter, Grand Rapids; W. E. Slater, Nunica; James E. Murphy, Grand Rapids; G. L. Dornbos, Grand Haven; H. J. Van Zaligen, Muskegon; Jacob Glerum, Grand Rapids.

LANSING SOLVES HOUSING

LANSING, MICH., July 3—Lansing's housing problem is to be solved through the organization of a $1,000,000 building corporation to meet present acute demands made by rapid industrial expansion. About $500,000 of this capital has been raised. This part of the task will be completed within a week. Merchants and industrial concerns have subscribed $125,000 of the capital, the Olds Motor Works has subscribed $650,000, and the General Motors Corp. the remaining $225,000.

GRAHAM ON HIGHWAYS

NEW YORK, July 3—George M. Graham of the Pierce-Arrow Motor Car Co. has been appointed a member of the highways committee of the N. A. C. C., of which Roy D. Chapin, of the Hudson Motor Car Co., is chairman.

V. C. Kloepper has resigned as chief engineer of the automotive department of the National Tool & Manufacturing Co., St. Louis, Mo.

A. B. Browne, a major with the Motors and Vehicles Division of the U. S. Army, has become associated with the A. J. Detlaff Co., clutch manufacturers, Detroit.

Heber H. Smith has resigned as western manager of Colliers to join the Green, Fulton, Cunningham Co., Detroit.

H. R. Clime, until recently special representative of the Globe Rubber Tire Mfg. Co. in the east, has been appointed manager of the company's Chicago branch in charge of the central territory, with headquarters at 2029 South Michigan Avenue.

J. C. Witwer, who has been assistant superintendent in charge of production for the International India Rubber Corp., South Bend, Ind., has been promoted to factory manager. He was formerly with the Kelly-Springfield Tire Co. and with the Goodyear Tire & Rubber Co.

William H. Walker, president of the Walker Mfg. Co., Racine, Wis., died of angina pectoris at his home here on June 21, in his 69th year. He is survived by his widow and three children, Mrs. W. S. Holden and two sons, Willard and Warren.

Men of the Industry

Changes in Personnel and Position

EXPORT MANAGER RESIGNS

LONDON, ENGLAND, June 20 (*Staff Correspondence*)—Frank J. Rowan, who has managed the British business of Gaston, Williams & Wigmore of New York, has resigned. His future business plans had not been disclosed, but it is believed that he will be identified with a British product.

Rowan was instrumental in placing American trucks in British service departments at an estimated value of $5,000,000.

Guy W. Vaughn has been appointed vice-president and general manager of the Van Blerck Motor Co., Monroe, Mich., maker of marine engines. During the war, Mr. Vaughn was in charge of production for the Wright-Martin Aircraft Corp., making Hispano-Suiza engines. Previously he was assistant to the president and sales manager of the F. B. Stearns Co., Cleveland.

Charles F. Barth, manager of the engine and axle department of the Chevrolet Motor Co., Flint, Mich., has been promoted to general manager, and Thomas E. Houghton, manager of the assembly department, has been promoted to factory manager.

LOCOMOBILE MEN RETURN

BRIDGEPORT, CONN., July 8—Three former Locomobile men have returned to the company. J. Murray Page has been appointed Western district manager of the Locomobile Co. of America. Clinton B. Amorous, recently returned from duty as major in the aircraft zone of advance in France, is Chicago manager. J. W. Florida, a lieutenant-colonel in the Motor Transport Corps in France, resumes his old position of assistant manager at the Philadelphia branch.

H. E. Henry, formerly sales manager of the Fulflo Pump Co., Blanchester, Ohio, has been appointed sales manager of the Michigan Machine Co., Detroit.

JEANNIN ELECTRIC FORMED

COLUMBUS, OHIO, July 7—C. H. Clement, formerly with the Bock Bearing Co., is president and treasurer of the recently incorporated Jeannin Electric Co., which will manufacture electric motors. H. W. Jeannin is vice-president, and Morton C. Seeley is secretary. The company is incorporated for $150,000. A factory will be built having an estimated output of 100 motors daily.

JORDAN DISTRIBUTES PREMIUMS

CLEVELAND, July 8—The Jordan Motor Car Co. has distributed $25,000 to its employees as premiums, 15 per cent of previous year's wages being given to each one in the company's service two years or more, 12 per cent to those there from one to two years, and 10 per cent to those in the company's employ less than a year.

Indiana Section of the S. A. E. Studying Nutritive Theories

The recent meeting of the Indiana Section of the S. A. E. was held at a horseshoe table. L. H. Pomeroy was the chief speaker

Current News of Factories

Notes of New Plants—Old Ones Enlarged

JORDAN PLANS NEW PLANT

CLEVELAND, July 3—The Jordan Motor Car Co. has issued approximately 6000 shares of 7 per cent cumulative preferred stock. This issue is to provide additional working capital, which includes the erection of a new plant. The new plant will be complete about July 15 and will permit an increase in output from 10 to 30 cars, bringing up this year's production to 7500 cars.

Under the reorganization, Edward S. Jordan retains the presidency and control of the company; T. E. Borten remains vice-president; Paul Zens is secretary and assistant treasurer; and Otto Miller is treasurer. The board of directors is composed of W. B. Riley, Russel Begg and C. L. Bradley.

Net profits of the company Dec. 31 last, after deductions for taxes and contingencies, amounted to $1,261,419.84.

The company's plants were operating to about 50 per cent capacity on war work. Government claims outstanding Jan. 1 last, included $1,341,794 in accounts receivable, $224,305 in claims covering the company's commitments and $66,793 in indirect government contracts. All but $600,000 of this has been settled, it is said.

MAIBOHM AT CAPACITY

SANDUSKY, OHIO, July 3—The Maibohm Motors Co., which recently moved here from Racine, Wis., is turning out 40 complete cars weekly, which is the capacity of its present temporary quarters.

The new plant, with 75,000 sq. ft. of floor space, will be ready July 31. It will have a production capacity of 50 cars a day. Operations in the new plant will start on a schedule of 10 cars daily and will be steadily increased.

JACKSON MAKING TRUCKS ONLY

JACKSON, MICH., July 3—The Jackson Automobile Co. will start production on its 3½-ton four-wheel drive truck within 2 weeks. This company, which has been practically idle since the signing of the armistice, has discontinued manufacture of passenger cars. Material for the initial run of trucks has been obtained.

FISHER ADDS 3¼ ACRES

DETROIT, July 3—The Fisher Body Corp. has purchased 3¼ acres adjoining its Fort Street plant to provide space for future expansion. The price paid was $18,000 an acre.

CUSHION SPRING DOUBLES CAPACITY

JACKSON, MICH., July 3—The Jackson Cushion Spring Co. is preparing to double its plant capacity and production. Two plants of the Borden Condensed Milk Co. were recently purchased, and are being converted into spring factories. Five hundred men are now at work, but this force will be increased to 1000.

STANWOOD RUBBER PLANT

NEWARK, N. J., July 7—The Stanwood Rubber Co., recently incorporated, will be in production of tires and tubes by September. Its steel and concrete plant has a floor space of 68,000 sq. ft. and occupies a 7-acre site. Equipment is being installed.

Officers of the company are: President, C. E. Barker, vice-president and treasurer of the Mutual Tire & Rubber Co.; vice-president, Ed. Hutchins, president of the Chippewa Rubber Co. and consulting engineer; treasurer, R. B. Gillette, vice-president of the Gillette Rubber Co. The chairman of the board of directors is S. P. Woodard, president of the Gillette Rubber Co.

MIDWEST OPENS BRANCHES

INDIANAPOLIS, July 3—The Midwest Engine Co. has opened four branch offices. D. J. Carrison will represent the company in Jacksonville, Fla. Chester B. Loomis will manage the El Paso, Tex., office, covering western Texas, Arizona, New Mexico and southern California. Mr. Loomis had a consulting and mechanical engineering office in Los Angeles until he entered government service. B. H. Downing is eastern sales manager with offices at 11 Broadway, New York City, and J. R. Lowe is manager of the New Orleans office, handling the southern territory.

RIM CORP. ORGANIZED

BERRIEN SPRINGS, MICH., July 3—The Lightning Change Rim Corp. has been organized with the following officers: President, J. L. Mitchell; first vice-president, W. S. Mitchell; second vice-president, Harold Myers; secretary, Fred S. Bynon; treasurer, G. L. Valentine.

BOHNET SPECIALIZING ON SEDANS

LANSING, MICH., July 3—The John H. Bohnet Co. has abandoned special body making and will confine production to sedan bodies. The company has just signed a $1,000,000 contract with the Briscoe Motor Corp. for sedans.

BUICK EMPLOYING SOLDIERS

FLINT, MICH., July 3—The Buick Motor Co. has given employment to 1400 returned soldiers and is re-employing them at a rate of nearly 300 a month, or 15 a day. A total of 3003 employees were in service, of which nearly 40 per cent are back.

KEYSTONE 2-TON TRUCK

PHILADELPHIA, July 3—The Keystone 2-ton truck was designed by Hilton W. Sofield, vice-president and general manager of the Commercial Car Unit Co.

It has a rated capacity of 4000 lb., a maximum permissible weight on chassis of 5200 lb., including body, load and special equipment. It uses a Keystone 4-cylinder 4-cycle vertical engine, 4 in. bore and 4½-in. stroke, having an S. A. E. rated horsepower of 25.6. Its maximum speed is 16.2 m.p.h. The wheelbase is 144 in. Pneumatic tires used are 34 x 3½ in. or 35 x 5 in. in front, and 36 x 5 in. solid or 36 x 6 in. pneumatics in rear. The drive shaft is in two sections, with three universal joints. Russel internal gear axle is used, the hubs being fitted with Timken bearings.

Other features of the specifications include: Thermo-syphon cooling; Berling magneto; Zenith carbureter.

TIMKEN ADDS BRANCH

CANTON, OHIO, July 7—The Timken Roller Bearing Co. will put up a plant at Columbus, Ohio, costing over $1,500,000. A main factory building, 600 x 300 ft. and two buildings 60 x 150 and 80 x 120 will form the nucleus of the new plant. The buildings will be up and the plant in operation in 60 to 90 days. The new branch will add 1000 men to the payroll, in addition to the 3500 at the factory here. The personnel of the branch addition will be built around a group from the parent organization.

IRON WORKS REORGANIZED

GRAND RAPIDS, MICH., July 3—The Leitelt Iron Works has been reorganized with a capital stock of $250,000 and is about to incorporate. David C. McKay, who has been identified with the company for 4 years, is president. The other officers include: Vice-president, F. J. Zylman; secretary and general manager, F. H. Meyer; treasurer, G. W. Sackett. The directors will consist of the officers and Charles B. Kelsey, chairman, A. L. Murray and S. O. Fink.

DIVIDENDS DECLARED

NEW YORK, July 3—To provide funds for development during the construction period, the directors of the Pierce Arrow Motor Car Co. voted today to omit payment of the quarterly dividend due Aug. 1 on common stock. Since May, 1917, disbursements have been at the rate of $1.25 a share every three months.

Moon Motor Car Co., St. Louis, Mo., regular 1¾ per cent quarterly dividend on the 7 per cent preferred stock, paid July 1.

The Sparks-Withington Co., Jackson, Mich., 3 per cent dividend on common stock in addition to the usual dividend of 1¾ per cent on preferred stock. Both were paid July 1 to stockholders of record June 23.

Disposing of Surplus English War Vehicles

Suggested as Means of Securing Colonial Markets—Fear Presence of American Products

LONDON, June 20 (*Staff Correspondence*)—The disposal of Government service vehicles is going on steadily, and large prices are being consistently obtained for them. Various suggestions ase being made with the object of getting more public value from them.

One suggestion, which has been adopted, is the setting up of a special body to assist soldiers and other war-service men to acquire the vehicles as a means of livelihood, while another plan, also in forming, is to ship a number to British colonies. Some people fear that unless British vehicles soon go to British territory abroad the chances of securing these markets for British trade will become more remote.

Massac Buist, one of our best informed publicists, commenting on the recent announcement that the Ministry of Supplies has been treating with responsible British overseas governments regarding the disposal of these vehicles, considers that this action does not imply that all the surplus government owned motor vehicles will be so disposed of, and urges that it is necessary to send them abroad to supply at the earliest moment the large demand there for vehicles.

On the principle that "first arrived, first disposed of," this writer fears that American vehicles will be first on the spot and readily disposed of.

Meanwhile it is regretted that there continues to be little show of the promised British output of cars, without reference to trucks, so long expected. It is better with the truck side of the industry, doubtless due to the fact that this industry was better organized for war time production.

2-CYLINDER ENGLISH ENGINE

LONDON, ENGLAND, June 20 (*Staff Correspondence*)—The Beardmore Co., whose interests range from steel and warship making to the Arrol-Johnston motor car, are credited with the intention to build taxicabs conforming to the London street traffic authorities' requirements. A special factory will be built for the purpose at Paisley, adjoining the former works of the Arrol-Johnston Car Co.

This firm also, it is said, is planning to adapt a recent munition factory at Annisland Glasgow to the manufacture of an 8 and 10 hp. chassis suitable for a light-car or parcels-van.

It will have a 2-cylinder engine of the opposed horizontal type, with a mileage of 40 mi. to the gallon (British) and a speed of 30 m.p.h claimed for the experimental model.

It is estimated there are some 30,000 Fords in use here as utility vehicles. The Ford, however, has a 4-cylinder engine, as compared with the 2-cylinder of the promised rival. It is a question whether a 2-cylinder vehicle will be able to fill the bill, as regards quick acceleration, which is essential to any modern light-purpose vehicle.

CUBITT CAR FINANCED

LONDON, ENGLAND, June 20 (*Staff Correspondence*)—The Cubitt car is one of a number of new cars which are to come from hitherto untried engineering firms. Their coming is looked forward to because most of them are listed at lower prices than similar cars by older firms. It is listed at £298 ($1,500), on a specification comparing to that of cars listed at double and more than double its price. A new company flotation with a capital of £600,000 ($3,000,000), £130,000 ($650,00) of which will be set aside towards the cost of 5000 cars and the balance of £140,000 ($700,000) will, it is expected, suffice for working capital, has been issued.

Mr. Hunter, the factory manager, was with the Ford Motor Co. in the United States for several years, besides some 11 years with English motor and cycle companies, and previously was with Clayton & Shuttleworth, Ltd., at Lincoln. This flotation, like the Austin £1,000,000 ($5,000,000), is reported to have been successful.

ENGINE FIRMS MAKE CAR

LONDON, ENGLAND, June 20 (*Staff Correspondence*)—Further new-comers into the motor industry are the old-established and recently amalgamated companies of Ruston, Proctor & Co., Ltd., Lincoln, and R. Hornsby & Sons, Ltd., Grantham, these companies being now known as Ruston & Hornsby, Ltd., with headquarters at Lincoln.

Both firms have a long and good reputation as makers of agricultural machines, including steam engines, and in more recent years oil engines. During the war they were makers of aircraft engines. It is now announced that they are going to put a motor car on the market under their joint names.

CAPITAL FOR ROVER

LONDON, ENGLAND, June 20 (*Staff Correspondence*)—The Rover Co., whose 12 hp. single model car is listed at double its pre-war price, is in the market for £500,000 ($2,500,000) additional capital. Part of this amount is to be used to produce a new model light car.

This company isolated its motorcycle business some time ago, and for a year or two before the war had concentrated on a single model car of 12 hp.

JONES RESIGNS

WASHINGTON, July 7—Grosvenor M. Jones, first assistant director of the Bureau of Foreign & Domestic Commerce, Department of Commerce, has resigned and will be replaced by Philip B. Kennedy, now Commercial Attaché at London. Mr. Jones has become affiliated with a New York bank.

U. S. Distributes 11,000 Army Trucks

414 Tractors, 550 Passenger Cars and 1075 Fords Also Included

WASHINGTON, July 7—The 11,751 army trucks valued by the War Department at $33,432,395, together with 414 tractors, 550 miscellaneous touring cars and 1075 Fords have been turned over by the War Department to the Department of Agriculture and in turn distributed to the various state highway departments for use in the construction and maintenance of highways throughout the United States.

The fourth allotment of several thousand trucks, cars and tractors will be made shortly.

The trucks are of 24 types and sizes, including 1½-ton Kelly-Springfield, light aviation, 2-ton Federal, International, Nash Quads, Denby, Kelly-Springfield, Moreland, Selden and Wilson, 2½-ton Mack, 3-ton heavy aviation, Denby, Federal, Gramm-Bernstein, Peerless, Republic, Standard, Velie, and White, 3½-ton Kelly-Springfield and 5-ton Holt, 53 15-ton Holt, 29 Gray wide drum and 20 Cleveland tractors.

Miscellaneous touring cars comprised more than 20 makes.

Texas received the greatest number of trucks, taking 699; Illinois the largest number of tractors, taking 99; Texas the largest number of touring cars, taking 30, and the greatest number of Fords, receiving 58; Illinois received 523 trucks, 99 20-ton caterpillar tractors, 22 touring cars and 44 Fords; Iowa, 345 trucks, 10 Gray tractors, 15 touring cars and 29 Fords; California received 361 trucks, 15 touring cars and 30 Fords.

These trucks, cars and tractors are being distributed by authority of legislation authorizing the War Department to turn over road building and other equipment, including trucks and tractors to the Departments of Treasury, Post Office and Agriculture. The Department of Agriculture allocates the equipment to the various states according to demands and requirements, allowing the states to use the equipment directly or to loan it to contractors at reasonable rates.

NEW AVIATION PAPER

LONDON, ENGLAND, June 20 (*Staff Correspondence*)—Now that the ban on new journals in Great Britain has been raised, a journal entirely devoted to the commercial side of flying has just published its first number under the title of *"Commercial Aviation"* This is a well produced little periodical, with apparently a good deal of practical knowledge behind it.

Major W. T. Blake, who is known by the pen-name of "Wing Adjutant," is concerned in the venture, and Mrs. Harry Hawker conducts the woman's page. Col. G. L. P. Henderson contributes a long letter on the flying regulations.

RECORD MANGANESE PRODUCTION

WASHINGTON, July 3 — Domestic production of high grade manganese ore in 1918 totaled 304,336 tons or 250 per cent more than the production for 1917. The shipments of low grade totaled 898,-332 tons, containing 10 per cent to 35 per cent manganese and 245,585 tons containing 5 per cent to 10 per cent of manganese.

Domestic consumption of ore for steel alloys, for which it is chiefly used, were estimated at 850,000,000 tons for 1918. this quantity being sufficient to manufacture the 45,000,000 tons of steel produced. The domestic sources supplied between 32 per cent and 35 per cent.

1,900,000,000 LB. OF COPPER

WASHINGTON, July 7—The smelter output of copper in 1918 totalled 1,908,-533,595 lb. as compared with 1,886,120,-721 lb. in 1917 and 1,927,850,548 lb. in 1916. The total production of new refined copper in 1918 was 2,432,000,000 lb., an increase of 4,000,000 lb. over that of 1917, according to figures made public to-day by the Department of the Interior.

Copper consumption in 1918 in the United States totalled 1,661,669,576 lb. as against 1,315,670,803 lb. in 1917. The stocks of refined copper on hand on Jan. 1, 1919 totalled 180,000,000 lb. as compared with 114,000,000 lb. on Jan. 1, 1918, an increase of 66,000,000 lb.

Automobile, Truck and Parts Exports from New York for May

NEW YORK, July 8—Although there is not any tremendous advance in exports from New York for May over those for April, several of our foreign customers have shown a remarkable increase in orders. Japan, having taken nothing in April, had 229 cars and 59 trucks in May. Australia has jumped from 85 cars and 11 trucks in April to 148 cars and 43 trucks in May. It must also be remembered that all exported vehicles are not shipped from New York, but many leave from our Western ports.

	Trucks		Cars		
	Number	Value	Number	Value	Parts Value
Argentina	..	....	21	$17,368	$273,395
Australia	43	$61,134	148	154,336	112,190
Barbados	6	3,023	15	11,579	1,550
Belgian Kongo	..	....	..	....	800
Belgium	..	....	101	33.037	1,477
Bolivia	..	....	..	....	1,465
Brazil	15	15,422	246	212,135	89,198
British East Africa	..	....	..	....	3,986
British East Indies	6	12,475	..	....	1,195
British Guiana	..	....	5	4,568	2,540
British Honduras	..	....	..	....	....
British India	22	50,630	98	108,738	40,026
British Oceana	..	....	..	....	69
British South Africa	7	11,805	233	383,624	193,887
British West Africa	8	10,231	2	1,500	9,900
British West Indies	1	450	3	1,541	2,553
Chile	..	....	22	16 418	33,453
China	9	22,550	126	105,643	18,721
Colombia	3	1,515	9	10,992	6,396
Costa Rica	..	....	1	1,040	2,066
Cuba	17	31,003	210	148,544	167,224
Danish West Indies	..	....	..	....	202
Denmark	32	54,549	107	133,191	3,889
Dutch East Indies	12	17,606	70	84,296	43,094
Dutch Guiana	..	....	..	....	223
Dutch West Indies	..	....	..	....	278
Ecuador	..	....	14	24,563	2,889
Egypt	..	....	..	....	1.528
England	8	13,615	69	110,160	342,448
France	..	....	29	120,710	22,314
French Africa	3	8,406	16	9,074	24,248
French East Indies	..	....	1	2,800	1,412
French Guiana	..	....	..	....	....
French West Indies	7	8,316	8	4,182	7,243
Gibraltar	..	....	..	....	33
Greece	3	1.753	53	51,278	6,697
Guatemala	..	....	5	2 912	911
Haiti	2	1,007	21	9,615	12.594
Honduras	..	....	..	....	804
Hongkong	..	....	16	20,381	2.343
Iceland	7	9,061	25	19,275	3,030
Ireland	..	....	..	....	41
Italy	..	....	..	....	13,440
Jamaica	10	8,163	7	5,218	15,229
Japan	59	72,234	229	149,726	23,732
Japanese China	..	....	..	....	400
Mexico	4	3,474	30	49,810	6,971
Morocco	2	1,008	96	46,379	7,250
Netherlands	..	....	25	27.002	6,813
Newfoundland	1	1,530	..	....	120
New Zealand	..	....	190	218,114	22,819
Nicaragua	..	....	12	7,545	832
Norway	75	133,075	89	127,014	6,198
Panama	1	700	4	3,744	7,420
Peru	1	2,640	15	32,951	21.387
Philippine Islands	59	100,795	168	162,047	86,034
Portugal	..	....	..	....	11
Portuguese Africa	..	....	..	....	60
Russia in Asia	..	....	20	9.643	115,680
Russia in Europe	..	....	..	....	....
Salvador	..	....	13	11,103	878
Santo Domingo	..	....	5	5.748	8,562
Serbia	..	....	..	....	....
Siam	..	....	..	....	2,359
Spain	2	1.619	85	83.515	9,464
Sweden	16	56.174	29	35,015	....
Switzerland	1	503	22	38.680	8,681
Straits Settlements	12	26 708	81	89.869	18,807
Trinidad	1	2,213	7	7,168	7,439
Turkey in Europe	..	....	11	7,950	64,837
Uruguay	..	....	265	180 811	40,878
Venezuela	5	2.515	20	26,031	10,039
Totals	460	$747,992	3,027	$3.128,578	$1,944,561

1,295,115 Barrels Crude Oil Produced

WASHINGTON, July 3—A total of 289 refineries are producing 1,295,115 bbl. of crude oil per day in the United States, according to announcement made to-day by the Bureau of Mines. Following is a list of the petroleum refineries in the United States, with the daily capacity:

State	Number of Refineries	Capacity, Bbls.
Arkansas	1	300
California	37	280,870
Colorado	2	1,500
Illinois	11	46,000
Indiana	2	36,500
Kansas	31	71,350
Kentucky	2	2,600
Louisiana	12	67,925
Maryland	4	15,500
Minnesota	1	300
Missouri	5	16,375
New Jersey	4	100,000
New York	4	34,500
Ohio	10	24,300
Oklahoma	79	233,300
Pennsylvania	48	90,935
Texas	26	212,050
Utah	1	800
West Virginia	5	7,700
Wyoming	5	52,250
Totals	289	1,295,115

CAR SHIPMENTS

NEW YORK, July 7—At the annual meeting of the members of National Automobile Chamber of Commerce, the Traffic Committee, consisting of Wm. E. Metzger, chairman (Columbia), A. I. Philp (Dodge) and F. C. Chandler (Chandler) made a report for the year ended June 1 which showed, among other things, that carload shipments of automobiles from the factories in the year ending April 30, 1919, amounted to 189,429 carloads compared with 224,805 in the previous year.

Arrangements were made with the Railroad Administration for sending empty automobile cars from all parts of the country into the manufacturing territory for factory shipments.

SHIP TO CARRY CARS

DETROIT, July 3—Plans for a fast steamboat to carry cars, trucks, tractors aud automotive supplies and implements are being made by the Detroit & Cleveland Navigation Co. It will be 300 by 75 ft., and will have two decks with two sets of elevators and will accommodate 275 automobiles.

The ship will run on no definite schedule. Its movements will be governed chiefly by the trend of the automobile traffic. Automobiles and parts will be carried to any point on the lakes. Other freight will be accepted whenever possible.

DETROIT SPRING CO. NEW

DETROIT, July 3—The Detroit Spring Co. is the name of a new corporation organized by Henry W. Cummings, James D. Cummings and Walter W. Cummings. The capital stock of the company is $50,000.

Calendar

SHOWS

Aug. 30-Sept. 6—Minnesota. State Fair.

Sept. 1-6 — Indianapolis, Ind. State Fair, Cars and Accessories, Indianapolis Automobile Trade Assn., John B. Orman, Manager.

Sept. 13-20—Cincinnati, O. Ninth Annual, Music Hall, Cincinnati Automobile Dealers' Assn., H. K. Shockley, Manager.

Sept. 15-20 — Springfield, Mass. Eastern States Exposition.

*Oct. 9-19—Paris. Grand Palais, International Automobile Mfrs. Congress.

Nov. 3-8—Chicago, Ill. Business Exhibit of Automotive Equipment Assn., Medinah Temple.

Nov. 7-16—London. Olympia Motor Car Exhibition—Society of Motor Mfrs. and Trades.

December — Brussels. International Automobile Mfrs. Congress.

January — New York. International Automobile Mfrs. Congress.

Jan. 3-10 — New York, N. Y. Grand Central Palace, National Automobile Chamber of Commerce, S. A. Miles, Manager.

Jan. 24-31—Chicago, Ill. Coliseum, Cars; Drexel Pavilion, Trucks; National Automobile Chamber of Commerce, S. A. Miles, Manager.

February — Chicago. International Automobile Mfrs. Congress.

Feb. 23-Mar. 6 — Birmingham, Eng. British Industries Fair.

TRACTOR SHOWS

July 14-19—Wichita, Kan. Automotive Committee of National Implement Assn.

July 28-29—Columbus, O. Tractor show in charge of Prof. H. C. Ramower, head of agricultural engineering department of Ohio State University.

Aug. 1-2 — Piqua, O. Tractor show in charge of Prof. H. C. Ramower, head of agricultural engineering department of Ohio State University.

Aug. 18-22—Aberdeen, S. D. Sectional Tractor Demonstrations.

Sept. 9-12—Streator, Ill. Northern Illinois Tractor & Truck Assn.

Sept. 15-20—Allentown, Pa. Lehigh County Agricultural Assn.

October—Ottawa, Ont., Can. Interprovincial Plowing Match and Tractor Demonstration.

Oct. 14-16—Ottawa, Ont. Tractor and Farm Machinery. Experimental and Booth Farms.

AUTOMOTIVE SHOWS AT FAIRS

Aug. 20-29—Des Moines, Ia. Machinery Hall.

Aug. 26-29—Madison, Wis. Cars, trucks and tractors, accessories, Dane County Fair, Madison Assn. of Commerce.

Sept. 1-5—Hartford, Conn. Connecticut Fair Assn.

Sept. 1-6—Rochester, N. Y. Automobile Club of Rochester. E. F. Edwards, Manager.

Sept. 8-13 — Milwaukee, Wis. Milwaukee Automobile Dealers, Inc., Bart J. Ruddle, Manager.

Sept. 8-13—Topeka, Kan. Cars, trucks and tractors, Motor Hall and Machinery Field.

Sept. 8-13—Syracuse, N. Y. Cars, trucks and tractors.

Sept. 12-20—Peoria, Ill. Cars, trucks and tractors.

Sept. 13-20—Hutchinson, Kan. Cars, trucks and tractors.

Sept. 15-20—Allentown, Pa. Lehigh County Agricultural Assn.

Sept. 15-20—Springfield, Mass. Cars, trucks and tractors. O. A. Nash, Asst. Gen. Manager.

Sept. 20-27—Oklahoma City, Okla. Cars, trucks and tractors. J. S. Malone, General Manager.

Sept. 22-27—Pueblo, Col. Cars, trucks and tractors. J. L. Beaman, Manager.

Sept. 29-Oct. 4—Meridian, Miss. Cars and tractors. A. H. George, General Manager.

Sept. 29-Oct. 4 — Chattanooga, Tenn. Chattanooga Auto Dealers' Assn.

Sept. 30-Oct. 4—Lancaster, Pa. Lancaster Fair Assn.

October—Columbia, S. C. Columbia Automobile Dealers' Assn.

Oct. 20-25—Raleigh, N. C. Cars, trucks and tractors.

Oct. 22-27—Shreveport, La. Cars, trucks and tractors.

CONTESTS

July 19—Uniontown, Pa. Speedway race.

*Aug. 15 — Middletown, N. Y. Dirt track event.

*Aug. 22-23—Elgin, Ill. 308 Mile road race.

*Aug. 23—Sheepshead Bay, L. I. Speedway race.

*Sept. 1—Uniontown, Pa. Speedway race.

*Sept. 20—Sheepshead Bay, L. I. Speedway race.

*Sept. 27—Allentown, Pa. Dirt track event.

*Oct. 1—Cincinnati, O. Speedway race.

*Oct. 4—Trenton, N. J. Dirt track event.

*Oct. 11—Danbury, Conn. Dirt track event.

*Tentative dates.

CONVENTIONS

July 9-10—Buffalo. Motor and Accessory Mfrs. Assn. Mid-summer convention.

Sept. 22-24—Philadelphia. Annual Convention, National Association of Purchasing Agents. Bellevue-Stratford.

Nov. 3-8—Chicago, Ill. Convention, Automotive Equipment Assn., Medinah Temple.

January, 1920—Washington. Pan-American conference.

May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.

INVENTORY OF GOVERNMENT STOCKS

WASHINGTON, July 3—Investigation of gasoline and motor car and truck stocks will be made by Congress. The Secretary of War has been ordered to furnish an inventory of the amount of gasoline held and ordered and prices paid, and an inventory of the motor cars, trucks and tractors on hand with an explanation of the inventory and plans for their disposition. The Secretary of Agriculture has been directed to report to the Senate the number of cars and trucks received from the War Department with detailed account of their disposition.

WAR TRADE BOARD TRANSFERRED

WASHINGTON, July 3—The War Trade Board has been transferred to the State Department which will hereafter have full jurisdiction over import and export restrictions.

URGE FREE PORT PLAN

NEW YORK, July 7—The National Free Zone Association, formed by merchants of the largest cities with the object of advocating establishment of a number of American free ports, was formed here recently. Its constitution prohibits the organization from taking part in free trade and protectionist issues, restricting it to working for creation of zones, along the line of the German pre-war system, in which imported articles might be held, duty free, for manufacture or re-shipment, being subject to import charges only in case they were forwarded inland.

U. S. TO SELL PLATINUM

WASHINGTON, July 3—The War Department surplus of platinum will be offered for sale at a minimum of $105 per ounce, and iridium at a minimum of $200 per ounce. The prices and orders are subject to cancellation without notice. The minimum offer which will be considered will be for ten ounces and the maximum to a single purchaser will be 1000 ounces. The sales will be made from the New York assay office.

BOOK ON HIGHWAYS

WASHINGTON, July 7—The American Automobile Association has issued a pamphlet entitled "A National Highway System." The pamphlet includes the past history of highway construction, the influence of motor traffic, and European experiments in road construction. It discusses a series of opinions for highway construction and includes statistics on highway mileage. It also summarizes the Townsend Bill providing for a Federal Highway Commission, and the Federal Aid Road Act.

EMPLOYMENT SERVICE CONTINUES

WASHINGTON, July 3—The United States Employment Service of the Department of Labor, which has been the cause of considerable controversy in Congress, has been awarded an appropriation of $400,000 and will be continued, as a result of the passage of the appropriation bill yesterday.

BULLETIN ON GASOLINE

WASHINGTON, July 7—A bulletin dealing with absorption plants and showing development of the industry of natural gas gasoline, written by W. P. Dykema, has been issued by the Bureau of Mines, Department of the Interior. A paper entitled "Recent Developments in the Absorption Process for Recovering Gasoline from Natural Gas" describes the absorption method of extracting gasoline from natural gas.

Photographic illustrations and detailed line drawings are included. The question of horizontal or vertical towers is covered thoroughly and the types of oil traps used to separate the oil and gas are described in detail. In addition, the bulletin deals with the flow of the oil and gas through the entire plant operation, the pressure, temperature and saturation features, and the various types of stills, condensers and heat interchangers.